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Some Economic Aspects of Military Procurement

MURRAY L. WEIDENBAUM
Economist, Boeing Airplane Company

AN ANALYSIS of the impact of military procurement on American industry necessarily begins with an examination of the customer's demand for goods and services. In absolute terms, the expenditures of the Department of Defense have risen from $19.8 billion in fiscal year 1951 to an estimated $41 billion for the year ending June 30, 1960 (see Table 1). Purchases by the Department of Defense are currently equal to almost one-tenth of the total output of the American economy. This level of military demand reflects an extended period of cold war preparation. An abrupt change in the nature of the external threat would probably cause a major shift in the proportion of the nation's resources devoted to armaments. The fiscal objective of a balanced budget and the economic objective of reducing government expenditures during an inflationary period may be important determinants of the total level of military outlays.

Changing Pattern of Military Spending

In the period since the end of the Korean conflict, the Air Force has supplanted the Army as the largest customer, accounting for almost half of total defense expenditures in recent years. The Navy and the Army each account for about one-fourth of total outlays.

The more basic change which has occurred during the past decade among the major categories of military expenditure has been the shift from operating the military establishment to obtaining new weapons. About one-half of total military expenditure is now devoted to "hard goods" and other capital-type items, a rise from about one-fourth in 1951.

Procurement of weapon systems accounts for the major portion of these capital "investments." A small but growing share is devoted to research and development and construction. Most of the purchases from private industry are in the capital category. This is the market characterized by specialized development and production of equipment on specific order. Here we see the explosive growth of science and technology demonstrating its effect. Many of these military requirements are continually advancing the frontiers of science.

In contrast, many of the military

Table 1. Composition of Military Expenditures

(Fiscal years; billions of dollars)

Expenditures	1951	1960
Capital outlays		
Equipment		
Procurement	$ 4.0	$14.6
Research and development[a]	.8	2.6
Plant		
Construction	.4	1.7
Total capital outlays	5.2	18.9
Operating expenses		
Employee-related costs		
Military personnel costs	7.1	10.6
Reserve components	.5	1.2
Other operating costs		
Operation and maintenance	6.7	9.5
Revolving funds, etc.	.3	.7
Total operating expenses	14.6	22.0
Total military expenditures	$19.8	$40.9

[a] Purchases of equipment for test and evaluation are here included under "procurement." Estimates of expenditures for research and development based on more inclusive definitions are not available on a historical basis.

Source: Office of the Assistant Secretary of Defense (Comptroller), *Department of Defense Expenditures by Major Budget Category*, EFAD-220, May 15, 1959.

purchases for "operation and maintenance" are standard commercial items or close variations. This category represents a limited market, but one of interest to nearly all elements of American industry. It is a relatively stable market, with a low rate of product obsolescence. It is mainly dependent on the number of military and civilian personnel in the defense establishment. Less than half of the expenditures for O & M involve purchases from private industry; most of the funds cover wages and salaries of civilian employees of the military establishment.

Procurement Trends

Within the procurement category, aircraft and missiles account for the greater share of the expenditures. Over half of Air Force equipment outlays are currently for manned aircraft, with the remainder used mainly for missiles and electronics. Moreover, the Air Force currently receives the major portion of military procurement funds.

Missile expenditures have rapidly become the dominant element in Army procurement. This category rose from about one-fourth of the Army procurement budget in 1956 to one-half in 1958, reflecting the sharp shift away from conventional artillery. Aircraft expenditures account for only 10 percent of Army procurement. Over half of the Navy procurement budget is devoted to aeronautical products — missiles and aircraft.[1]

Four major procurement categories — aircraft, missiles, ships, and electronics — account for 90 percent of total defense procurement expenditures in 1960. The remaining procurement funds are divided among combat vehicles, artillery, rifles and other traditional Army weapons, ammunition, and production facilities. Each of these latter categories has shown a major decline in recent years as a result of the shift from conventional land and sea equipment to advanced air and space weapon systems. Chart 1 illustrates the

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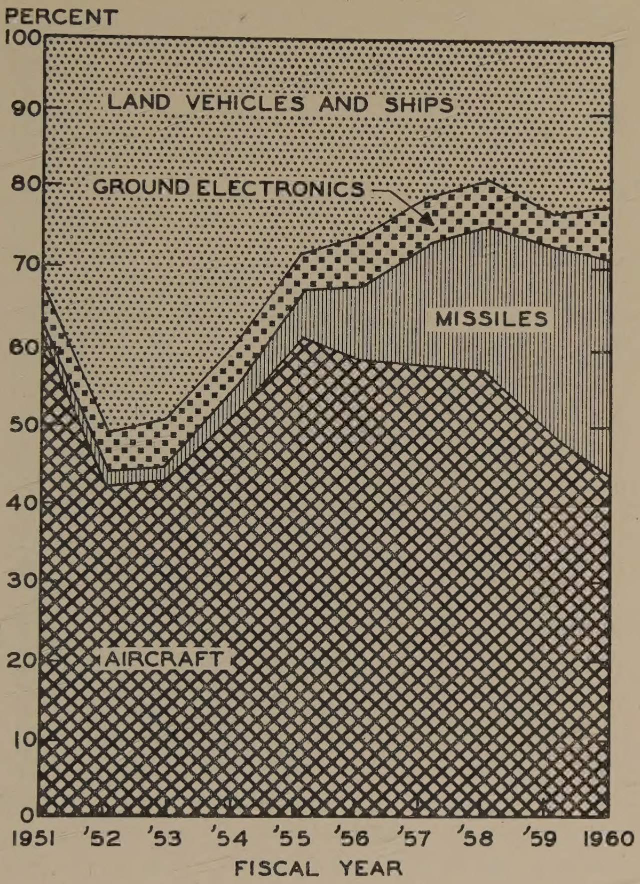
[1] Office of the Assistant Secretary of Defense (Comptroller), *Department of Defense Expenditures by Major Budget Category*, EFAD-220, May 15, 1959.

Chart 1. Military Procurement Expenditures, by Type



Source: Office of the Assistant Secretary of Defense (Comptroller), *Department of Defense Expenditures by Major Budget Category*, EFAD-220, May 15, 1959.

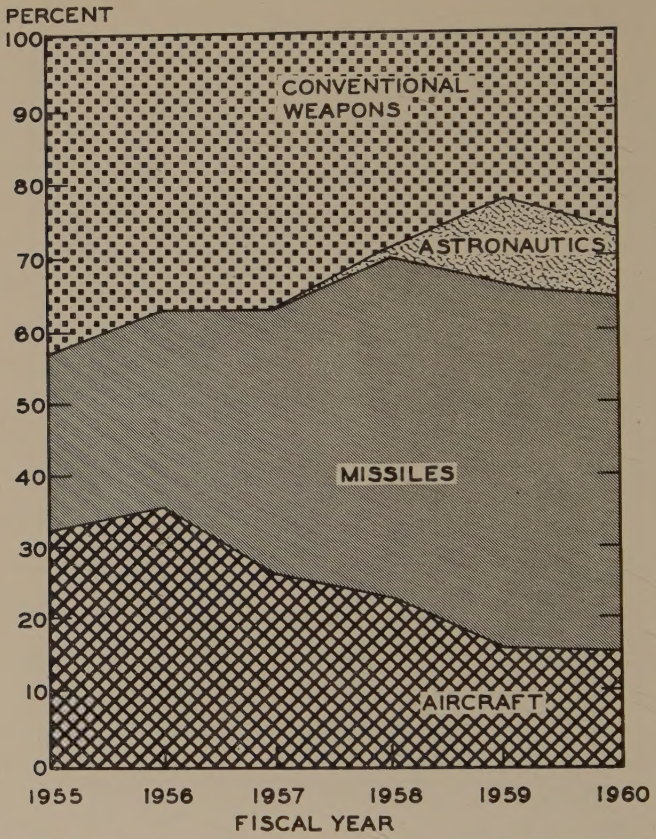
changing relationships among the major types of military procurement.

Research and Development Trends

By its very nature, military R & D is directed toward new weapon systems and related military purposes. The greater part of the expenditures is devoted to military weapons — aircraft, missiles, ships, tanks, and increasingly, space vehicles. As shown in Chart 2, the missile category has been dominant in recent years. These figures exclude expenditures for test and evaluation items, which are included in the procurement figure.

The National Science Foundation has attempted to allocate military R & D expenditures between "research"

Chart 2. Allocation of Military Research and Development



Source: *Budget of the U.S. Government for the Fiscal Year Ending June 30, 1961*, and earlier budgets.

and "development." It has estimated the research component at less than one-fourth for the fiscal year 1960. The amount devoted to *basic* research (as defined by the foundation) comes to approximately $100 million for the year.[2]

Changing Demands on the Military Suppliers

The changes in the customer's re-quirements have had a concomitan effect on the supplying industries. A shift from procurement of tanks and related motor vehicles to missiles and similar aeronautical equipment canno help but have important effects on th composition of the industries and com-panies supplying the military establish

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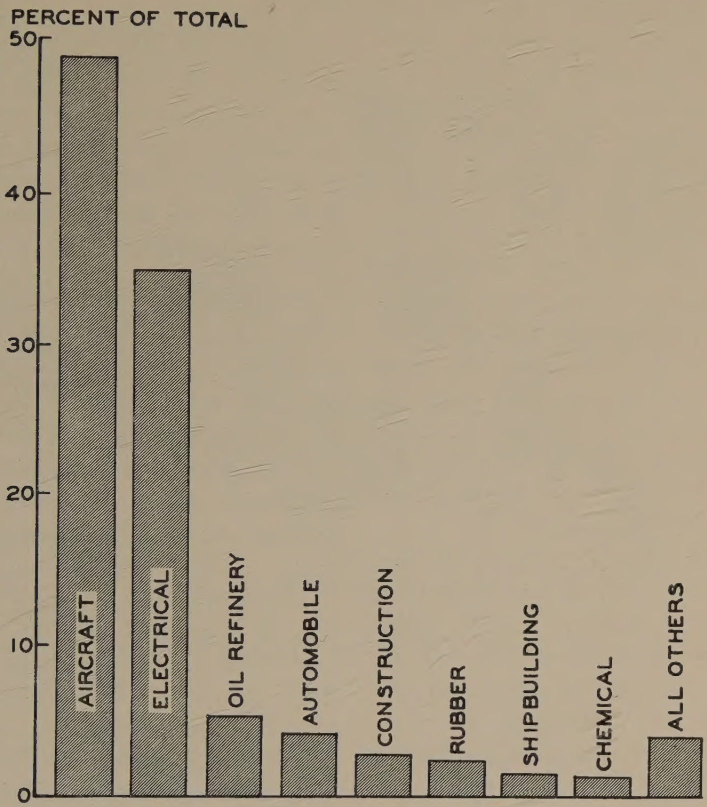
[2] National Science Foundation, *Federal Funds for Science,* VIII, The Federal Research and Development Budget, Fiscal Years 1958, 1959, and 1960 (Washington: Government Printing Office, 1959).

Chart 3. Distribution of Major Military Prime Contracts, by Industry



Source: Office of the Secretary of Defense, *100 Companies and 129 Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards,* Fiscal year 1959.

ment. The shifts in procurement categories also result from such newer factors as the transition from manned aircraft to missiles, the increasing performance and complexity of advanced aircraft and missiles, and increased emphasis on the ground environment of missile and space vehicle launching sites.

Industrial Distribution

The composition of the firms and industries supplying military goods and services is determined in large measure by the nature of the procurement requirements of the defense establishment. During the period July, 1950, to June, 1953, the time of peak procurement of Army ordnance equipment for the Korean conflict, General Motors, a major producer of tanks and trucks, was the leading military contractor in terms of size of orders received. It had fallen to twentieth by fiscal 1959. A relatively new company, the General Dynamics Corporation — a product of successive mergers of Electric Boat Company, Consolidated Vultee Aircraft Corporation, Stromberg-Carlson, and other firms — had risen to first place, primarily on the basis of its aircraft and missile work.[3]

Chart 3 shows the industrial distribution of the 100 firms holding the largest value of military prime contracts for fiscal 1959. These 100 firms accounted for 74 percent of the total value of military contracts awarded during the year. Eight major manufacturing industry groups accounted for 70 percent and all other industries for the remaining 4 percent.

Within the aircraft industry, the fortunes of the individual firms have risen and fallen. Grumman Aircraft Engineering Corporation, which was fifteenth on the list in 1959, did not appear at all as recently as 1956. Curtiss-Wright Corporation, the largest producer of aircraft in World War II (in terms of pounds of airframe manufactured), was down to number 53 in 1959. Moreover, its production did not include any complete aircraft but was limited to engines and other components. The Martin Company, mainly on the strength of its shift from aircraft to missiles, rose from twenty-third largest holder of defense contracts in 1950-53 to eighth in 1959. Numerous changes occur each year in the composition of the list of major defense contractors. Twenty-one of the 100 firms on the 1958 list did not make the 1959 list.

The "Missile Industry" — A Case Study

As was shown earlier, missile production has been the fastest-growing major segment of military procurement. It is also one that particularly cuts across industry lines.

Composition of Production

The assembly and testing of missiles represents about two-fifths of all missile work (production as well as R & D). About nine-tenths of this "integrative" function is performed by aircraft companies, who are prime contractors on most but not all of the missile projects.[4]

About one-third of missile production is accounted for by electronics work, both airborne guidance and control mechanisms and electronic ground support equipment. Over 80 percent of this work is performed by electronics and electrical machinery companies. Most of the remainder is performed by aircraft companies.

Propulsion systems represent about one-sixth of annual missile production. Four firms accounted for nine-tenths of the reported work in 1959. These consisted of a propulsion division of a major aircraft producer, a propulsion subsidiary of a major tire company, an independent chemical company, and a specialized producer of missile propulsion systems.

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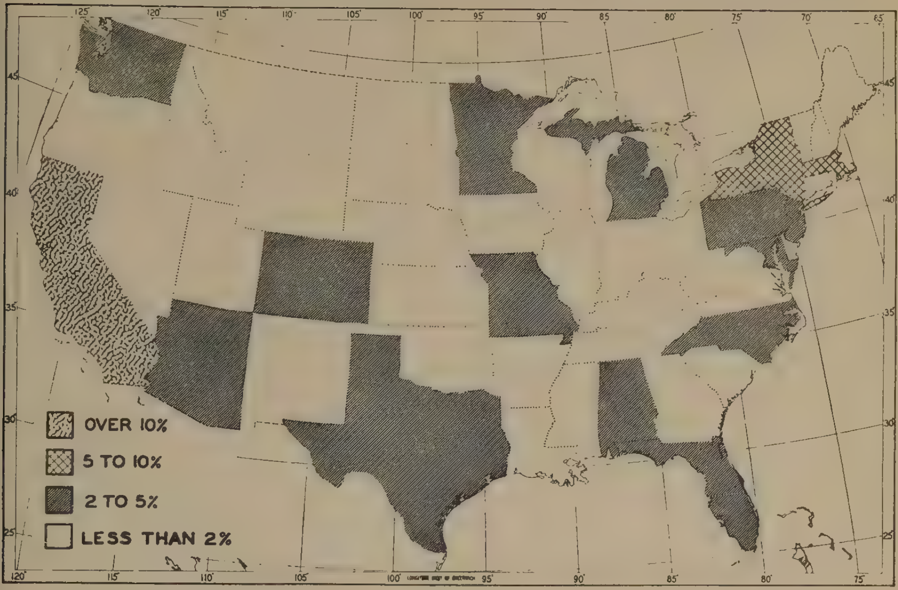
[3] Office of the Secretary of Defense, *100 Companies and 129 Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards,* Fiscal year 1959.

[4] U.S. Department of Labor, *Wage Survey Will Precede Aircraft Industry Minimum Wage Determination Proceedings Under Public Act,* Press Release USDL-2900, August 22, 1959, plus attachments.

Chart 4. Employment in Missile Activity by State, Percentage Distribution[a]



[a] Data for October, 1958.

Source: U.S. Department of Labor, *Manpower in Missiles and Aircraft Production,* Industry Survey No. 93, August, 1959.

The remaining 12 percent of missile production work in 1959 comprised non-electronic ground support, nose cones, and missile structure. The participating companies included many which were otherwise not represented in missile production, such as manufacturers of stationary launching platforms.

Distribution of Employment

A study of missile employment by the United States Department of Labor has been prepared on an establishment rather than a company basis. It is thus possible to obtain a geographical distribution of missile production (the Defense Department data, which are prepared on a company basis, cannot be used for this purpose). The geographical concentration as of October, 1958, can be seen in Chart 4. California accounts for much the largest share of missile work (127,000 workers or 40 percent of the total) with New York State in second place (7.5 percent and 24,000 workers).

By broad geographic regions, two West Coast states lead with 44 percent; five Middle Atlantic and New England states follow with 20 percent and six states in the South and Southwest with 17 percent of total missile employment. About 11 percent are employed in three Midwest states and 8 percent in states other than the top sixteen.

Impact on Military Suppliers

One of the striking economic relationships to be found is that between "growth" industries and the industries which comprise the major military suppliers.

Of all the major manufacturing groups in the American economy, transportation equipment has shown the fastest increase in terms of total income generated (contribution to the national income), with an average gain of 7.9 percent a year during the period 1929-57.[5] The fastest-growing area in the transportation equipment group was "aircraft and parts," the major portion of the output of which was sold to the military establishment.

The second fastest growing major manufacturing group was electrical equipment, which averaged 7.4 percent a year. The electronics subgroups, which constitute the most rapidly expanding area in electrical manufacturing, currently sell about 52 percent of their output to the military.[6]

Along these lines, a study by the Midwest Research Institute reported that "the military demand has been the major and almost exclusive dynamic growth factor in recent years."[7]

A recent study prepared for the Joint Economic Committee concluded that major features of the shift in industrial output patterns during the postwar period can be explained by two major factors: (1) fluctuations in military hard goods procurement and (2) the continuation of the long-run trend toward greater fabrication per unit of materials input.[8]

Schultze and Tryon analyzed the relationship between individual industry groups and cyclical fluctuations. They pointed out that, for the period 1948-56, durable goods industries grew at a faster rate than nondurable. However, substantial fluctuations occurred in the importance of the durables group. From 1948 to 1953 durable goods industries accounted for 72 percent of the total increase in manufacturing production. From 1953 to 1956, however, durables contributed only 37 percent of the output rise. They pointed out that five industries were responsible for 60 percent of the gain in total manufacturing production between 1948 and 1953: fabricated metal products, nonelectrical machinery, electrical machinery, transportation equipment, and instruments.

From 1953 to 1956, on the other hand, these five durable goods industries accounted for only 18 percent of the increase in manufacturing output. It was during this latter period that defense procurement was being reduced as a result, in part, of the termination of hostilities in Korea. Of the 18 percent contribution to output made by this group of industries, 13 points came from the electrical machinery and instrument industries alone, which, because of their importance in missile procurement, were less subject to the impact of defense cuts.

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[5] Compiled from U.S. Bureau of the Census, *Annual Survey of Manufactures* for various years.

[6] Electronics Industry Association, *Electronics Industry Fact Book*, 1959, p. 5.

[7] Stefan H. Robock, *Changing Regional Economies*, Midwest Research Institute, MRI-252, 1957, p. 4.

[8] Charles L. Schultze and Joseph Tryon, *Prices and Costs in Manufacturing Industries*, Study Paper No. 17, Joint Economic Committee (Washington: Government Printing Office, 1960), p. 14.

Schultze and Tryon concluded from this analysis that "The major factor behind this particular pattern of output behavior is, of course, the defense program."[9]

Mergers and Acquisitions

Since the end of World War II, many major defense contractors have attempted to diversify their operations. The motives were numerous and varied over time — to compensate for a declining military market, to offset the fluctuations in military budgets, to enter more profitable areas, and to adjust for shifts within the military market.

The efforts of these companies in entering civilian production after World War II took a number of forms and met with varying degrees of success and permanency. Some of these efforts were designed to take immediate advantage of a temporary demand for consumer items which had been in short supply during the war, and to help tide the companies over the reconversion period.

Many military suppliers attempted to use their know-how and to concentrate on lines where their capabilities would be particularly needed, such as producing aluminum canoes and sports boats — items which required their skills in fabricating aluminum products. Some of the related products were a bit far afield from their customary product lines, such as prosthetic devices and stainless steel caskets.

Gradually the shock of postwar adjustment wore off. Military orders continued, although at a rate sharply reduced from wartime levels. Also, the firms which traditionally dominated civilian markets once again asserted their supremacy in many civilian areas. With the tremendous expansion of military orders beginning in the latter half of 1950, the attention of aircraft and related military suppliers was increasingly focused on defense production.

Following the termination of the Korean conflict, a number of cutbacks were made in military procurement. For reasons of necessity or of desirability, many specialized military suppliers once again began giving increased attention to civilian markets. In the case of the aircraft manufacturing firms, the commercial activities at first remained at low levels. The majority of the large aircraft producers had commercial sales of 1 percent or less during 1952-55, the most recent years for which industry-wide data are available. The three major producers of commercial transports during that period had commercial sales of between 8 and 14 percent of their total volume.[10]

Available information does not permit making a split of these commercial sales between aircraft and non-aircraft products, but it appears from the evidence that the commercial non-aircraft sales of aircraft manufacturing firms were very limited in the years 1952-55. In the last few years, however, greater diversification has occurred among major military producers. These moves have generally been based on long-term considerations and have taken into account some of the mistakes of the past.

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[9] *Ibid.*, p. 13.

[10] U.S. House of Representatives, Committee on Armed Services, *Aircraft Production Costs and Profits* (Washington: Government Printing Office, 1956), p. 2725.

The stated philosophy of a major diversified defense supplier may be illuminating, if not typical:

> Reviewing the history of two almost disastrous wars and appraising the technological and ideological realities of this century, it is my conviction that defense must be a permanent business, a permanent way of life. And that in order to keep in being those aggregates of vital skills that underlie our capability not only to be strong but always to appear to be strong, the modern industrial corporation must, I believe, have a broader base. It must be strong in defense production, strong in civilian production . . .
>
> Those companies which are not yet diversified — which depend largely on military orders — obviously must contemplate serious problems of future growth . . .[11]

Recent diversification moves have relied heavily on an extension of a company's technology or on a closely allied field, generally within military and industrial markets. A number of diversification efforts of aircraft companies during the last several years have been in the area of components or subsystems for major military weapon systems. Several companies have either acquired independent electronic or propulsion manufacturers or organized internal operating divisions in those areas. Such moves are in line with the change in the product mix of military procurement.

The recent interest in mergers and acquisitions of nonmilitary producers shows every indication of continuing if not accelerating. Any serious consideration of nuclear disarmament or lessening of international tensions would be expected to increase the interest in broadening the product base of companies which are primarily military suppliers.

Internal Growth

The adjustments of military supplying firms to the changing patterns of defense procurement are not limited to the acquisition of or merger with other firms. Of greater importance, no doubt, is the large number of internal adjustments to change. Manufacturers of industrial handling equipment play an increasingly important role in supplying ground handling equipment for missiles. Certain electronics companies also serve as system managers for the production of complete missiles. Some aircraft companies have established electronics or propulsion divisions.

The most basic change may be in the fundamental shift in employment requirements from production workers to technical and managerial occupations. Table 2 shows the anticipated changes in the employment requirements of

Table 2. Changing Employment Requirements of a Producer of Aircraft and Missiles

Job categories	Percentage distribution of employees			
	1954	1959	1965	1970
Managerial. . . .	8	10	12	13
Technical	13	13	20	22
Semitechnical. .	3	8	9	10
Clerical workers[a].	12	21	26	26
Industrial workers	64	48	33	29

[a] Includes stenographic and other nontechnical office employees.

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[11] *Ibid.,* p. 2587.

a major producer of aircraft and missiles. The proportion of industrial workers is shown to decline from 48 percent of the firm's employment in 1959 to 29 percent in 1970. Technical, semitechnical, and managerial employment is estimated to rise from 31 percent to 45 percent during the same period. The rising trend in research and development costs relative to the production costs of military weapons undoubtedly is the major factor at work here.

The Outlook

The capital portion of military expenditures is likely to continue to increase, especially in the area of research and development, and to some extent, in construction of the ground environment of missile and spacecraft systems. Within the procurement category, missiles and, increasingly, space vehicles will probably command a rising share. This development is particularly apparent in view of the shift which already has taken place in the earlier stage of the weapon creation cycle — research and development — from manned aircraft to missile and astronautics programs. The recommended new obligational authority for missiles exceeded that for aircraft for the first time in the 1961 military budget. This indicates that the long-heralded "crossover" point for procurement between aircraft and missiles should occur in the early 1960's.

The over-all level of military expenditures since the end of World War II has fluctuated in response to essentially unpredictable influences — international developments such as the Communist attack on South Korea, the successful Russian launching of a "Sputnik," and this nation's reaction to these events. Some observers expect an absolute decline in the level of defense outlays, as a result of hoped-for relaxation of international tensions. Others advocate large and rapid increases in military expenditures in view of the growing strength of the Communist nations.

The writer believes that the most likely situation in the 1960's will be a continuation of the post-Korean pattern, with defense spending rising absolutely but constituting a declining portion of GNP. If the technically strong companies and industries which are currently the major military suppliers continue to be growth leaders in the American economy, it is likely that the current trend toward diversification will continue or accelerate. Should the nondefense sector of the economy expand more rapidly than the defense sectors, mergers between military suppliers and established companies in commercial markets may become more common.

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Mineral Fuels in the Soviet Economy, 1928-58*

DEMITRI B. SHIMKIN

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THE MINERAL-FUEL INDUSTRIES of the Soviet Union have a general analytic significance for four reasons. First, they represent a sector to which the Soviets have devoted exceptionally great resources of labor and capital. Therefore, output and productivity performance in the mineral-fuel industries has probably been better than the average for the nation's manufacturing, mining, and utility activities as a whole. Since no fully satisfactory direct measurement of Soviet industrial output over the past 30 years has been published to date, the establishment of at least an upper limit to this parameter has clear-cut value.

Second, the mineral-fuel industries have contributed a growing, and in recent years, the major proportion of the inanimate energy available to the Soviet Union over the years 1927/28-58. Assessment of the production of mineral fuels therefore provides the base for estimating one of the fundamental determinants of total economic activity in the U.S.S.R. over the past 30 years. Examination of trends in the total energy supply can be further combined with data on changing consumption patterns and efficiencies of utilization to provide insights into developments in economic structure and technology.

Third, qualitative and quantitative information on the Soviet mineral-fuel industries is more complete and less ambiguous than for most other branches. Consequently, many aspects of Soviet economic practice, such as the relationships between cost-price advantages and production policies, can be examined here with unusual clarity.

And fourth, the extent and quality of available information make possible at least limited comparisons with trends in mineral-fuel production and energy utilization in the United States.

This paper deals with the resources of fuels, trends in production and technology, capital and labor costs, and total energy supplies and their utilization. On the basis of these data it develops tentative comparisons on rates of expansion and structural change, on economic mechanisms and relative efficiencies, in the Soviet and American economies over the past 30 years.

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* For a fuller discussion, see the author's *The Mineral Fuel Industries of the Soviet Union, 1928-1958,* soon to be published in the Bureau of the Census Series P-95. The opinions expressed herein are those of the author and not necessarily of the Bureau of the Census.

Extent and Characteristics of Mineral-Fuel Reserves

The Soviet Union, like the United States, is endowed with enormous, widely distributed resources of solid, liquid, and gas fuels. These have been extensively prospected since 1928. In consequence, by January 1, 1958, measured and indicated reserves of coal and lignite, petroleum and natural gas, and peat totaled about 160 billion metric tons of conventional fuel equivalent (i.e., of heat value equal to 7,000 calories per kilogram, approximately that of good bituminous coal). Coal and lignite composed 85 percent of these reserves; petroleum and natural gas, 10 percent; and peat, 5 percent. However, the great bulk of Soviet coal reserves are in Siberia, poorly situated with respect either to present urban developments or even to potential agricultural regions. It should be noted that, despite appreciable eastward displacements of the Soviet population and economy over the past generation, 72 percent of the nation's urban population and perhaps 80 percent of the manufacturing output in 1959 were located in European Russia, north of the Caucasus and south of 60°N, and in the Urals. Two large zones of industrialization — the Eastern Ukrainian-Volga-Central Russian-Baltic continuum and the Urals — are especially important (Chart 1). Soviet petroleum and natural gas resources are well located in relation to these zones.

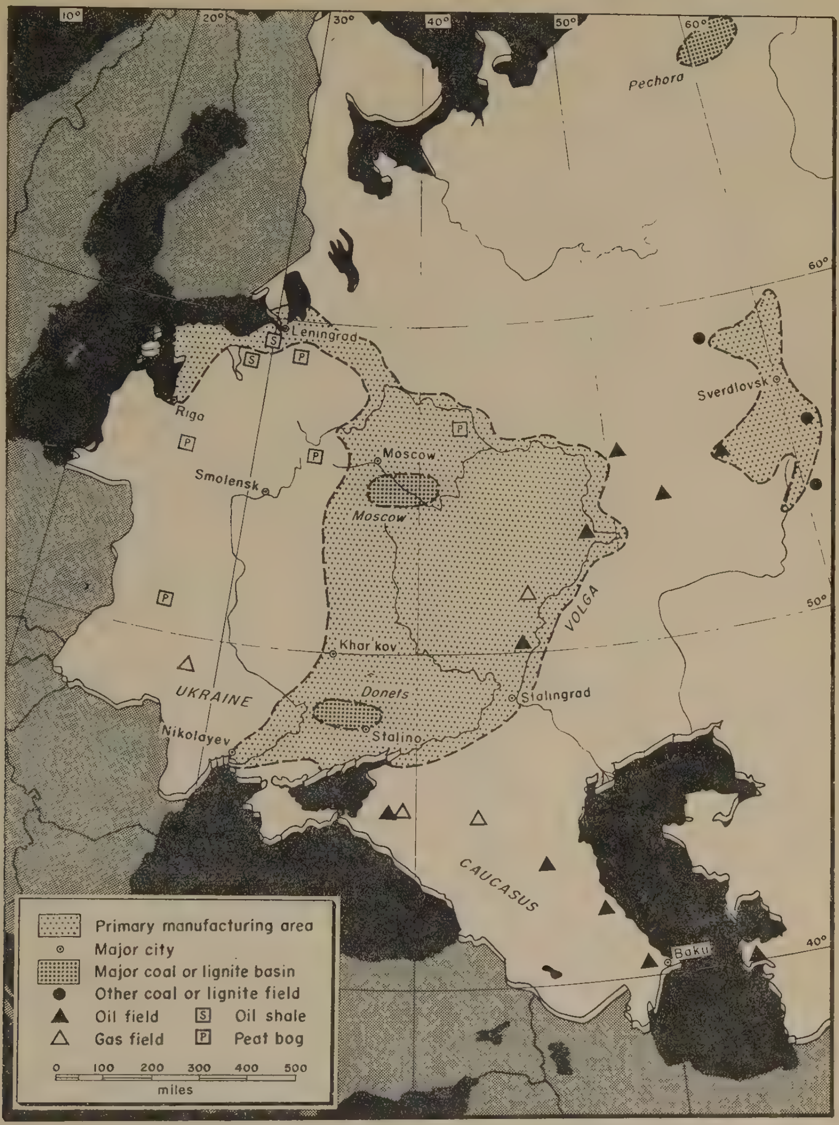
Even in European Russia, Soviet reserves of coal and lignite provide ample, though often poor and costly, sources of energy. However, large reserves of coking-grade coals are limited to four fields, the Donets Basin in the Ukraine, Karaganda in the Kazakh Republic, the Kuznetsk Basin in Western Siberia, and the Pechora Basin in Arctic Russia. Of these fields, only the Donets Basin is close to major supplies of good iron ore and manganese. Even that field is plagued by steeply pitched seams, unstable roofs, flooding, and gas bursts. Also the coal holds large quantities — 2 and 3 percent — of chemically bound sulphur.

Nevertheless, the Soviets have utilized all four fields extensively for metallurgy as well as for general-purpose energy. To this end they have built high-capacity, heavy-duty, and well-subsidized rail lines to bring together distant coal and iron.

The second grade of Soviet coal reserves is largely subbituminous. Important fields have been discovered and partially developed in Central Asia near Tashkent, in an extensive area of Central Siberia from Kansk southeast to Lake Baykal, and in southern Yakutia. All three fields have large potentials connected with local nonferrous and ferrous metal resources, once the technology of coke manufacture from friable and gassy fuels has been perfected. The Yakutian potential is especially important strategically, since to this day the entire Soviet Union east of Lake Baykal lacks an integrated metallurgical base; the only large steel mill in that area, at Komsomol'sk operates on Manchurian pig iron and scrap.

In the areas which hold the over-

Chart 1. Location of Industrial Areas and Fuel Resources



whelming bulk of Russia's population, great cities, and industry — the Urals, the Volga, Central Russia, and the Baltic states — the coal resources are qualitatively miserable. In essence, they are limited to the ashy, high-sulphur, and relatively deep deposits of the Moscow lignite basin and to the numerous small fields of the Urals, which are mostly subbituminous coals and lignite. These local resources are supplemented by coal from other areas (about 10 million tons a year are hauled to Central Russia from Western Siberia alone), by other fuels and sources of energy such as petroleum, natural gas, shale oil, peat, and hydroelectric power; and most recently, by Ukrainian natural gas.

For the future, Central Russia presents optimal conditions for atomic power reactors. This area combines a large population, a skilled labor force, and increasing industrial, agricultural, and household demands for energy with high-cost fuels presenting serious problems of water and air pollution in their extraction and combustion and with overburdened transportation networks.

Peat and oil shale are widespread and theoretically very extensive in the Soviet Union. In fact, however, even heavily subsidized operations appear worth while only in a few localities. The peat industry is essentially confined to a radius of some 350 miles from Smolensk in West Russia; within this area, the supply of mature, stump-free bogs has been depleted, so that the quality of peat produced has dropped considerably since World War II. Since peat extraction requires considerable labor and peat itself is difficult to transport, the great bulk of Soviet peat resources, which are found in inaccessible North Russian and Siberian regions, must be discounted economically.

A similar situation obtains in oil shale, most reserves of which are too poor to compete with coal, lignite, or petroleum. Actually, 85 percent of today's oil-shale industry is confined to Estonia and adjoining parts of Leningrad Oblast. It provides raw materials for synthetic fuels and lubricants and for manufactured gas.

Very large volumes of sedimentary rock in the Caspian Basin, in the Ukrainian and Volga-Urals troughs, in the Western Siberian Basin, and more conjecturally, in the Baykal, Lena, Kolyma, and Okhotsk Sea depressions bestow on the Soviet Union correspondingly significant potentials in oil and gas resources. They are certainly greater than those of the United States and may approach those of the Near East in size. However, before World War II, little geophysical work, inadequate drilling, and a complete neglect of conservation held proven reserves to twenty to thirty years of current output, or a maximum of a billion tons. Three-fourths of the reserves were in the Caspian Basin. Over the past twenty years, proven reserves have been expanded more than sixfold and are now largely concentrated in the West-Central Urals and the Mid-Volga regions. Also important has been the discovery of extensive gas reserves in the Ukrainian, North Caucasian, Mid-Volga, West Kazakh, and most recently, Bukhara regions. The vigorous expansion of natural gas output from these fields is the major element of Soviet fuel planning today. The central problem, and limiting factor, has been the shortage of pipe and pumps; in consequence, large quantities of by-product gas in the Urals and elsewhere are being flared off — in a country with an acute energy deficit. The same problem is fundamental for the Soviet petroleum industry, which still moves the great bulk of crude and refined products by railroad

Table 1. Production Trends in the Soviet Mineral Fuel Industries
(In millions of metric tons of 7,000 C/kg heat equivalent)

Fuel	Year			
	1927/28	1940	1950	1958
Total	51.2	203.6	283.3	596.8
Petroleum and natural gas	17.0	48.9	61.5	195.8
Bituminous and anthracite coal	30.3	129.5	173.4	314.6
Lignite, shale, and peat	3.9	25.2	48.4	86.4

tank car. Only recently has a pipeline as far east as the new Omsk refinery been completed. Because of this deficiency and because little progress has been achieved in developing Siberian oil and gas resources, the question of adequate liquid fuel for tractors, combines, trucks, and aircraft throughout Soviet Asia remains acute.

Trends in Production and Technology

In support of its intensive drive for industrial power the Soviet Union has, over the past 30 years, expanded its production of mineral fuels almost *twelvefold.* In 1928, it produced 51 million metric tons of standard fuel, or less than 6 percent of the American level of that year. By 1940, Soviet output had quadrupled and was more than a fifth of that in the United States (Table 1). In 1958, the Soviets produced almost 600 million metric tons of standard mineral fuel — almost half as much as we produced.

Accompanying this expansion has been a radical change in the distribution of Soviet mineral fuels production. In 1928, 70 percent of the nation's inanimate energy other than fuelwood and hydroelectricity came from one strip 800 miles long and 100 miles wide between Stalino and Baku. Elsewhere, fuelwood, which provided over half the national energy supply, was basic. Today, almost 90 percent of the Soviet energy supply comes from mineral fuels, but their output has been substantially decentralized. The two major producers, the Ukraine and the Mid-Volga–Western Urals regions, each contribute not quite a quarter of the national mineral-fuel supply.

Nevertheless, because the dispersion of consuming areas has been far slower than that of fuel production, the average haul has increased steadily. In particular, over 40 percent of the entire ton-mileage of the Soviet railroads is engaged in the movement of coal, coke, crude oil, and petroleum products. A slow development of pipelines and climatic limits on barge traffic have inhibited a shift to these modes of transport.

Moreover, tremendously expanded production and basic geographical relocation have led to an appreciable deterioration in the quality of fuels extracted in the Soviet Union between 1928 and 1958. Thus, the proportion of petroleum and natural gas in total output, measured in standard fuel equivalent, fell from a third in 1928 to slightly more than a fifth in 1950, recovering by 1958 almost to the initial level. At the same time, high-sulphur crudes, which were of negligible significance prior to World War II, now constitute about two-thirds of the total and present tremendous problems to the antiquated Soviet refining industry. The proportion of bituminous and anthracite coal approximated 60 percent until 1950 and then declined to 53 percent in 1958. For the entire output under the jurisdiction of the Ministry of Coal Mining, the average ash content of bituminous and anthracite coals produced rose from 13.7 percent in 1940 to 15.4 percent in 1955. Lignite, shale, and peat constituted 8 percent of the mineral-fuel output in 1928, almost 18 percent in 1950, and 14 percent in 1958. Here, too, quality has fallen. The average heat value of peat extracted by the largest producer (the Main Peat Administration of the Ministry of Electric-Power Stations) fell from 2,301 C/kg in 1946 to 2,074 C/kg in 1955.

The technological development of the Soviet mineral-fuel industries has been uneven, with the greatest advances being made in extraction and the least in beneficiation and refining.

In coal and lignite mining, the capacity of installed power equipment increased over twentyfold between 1928 and 1955. By then the horsepower in Soviet mines per physical ton produced almost equaled the American level and was a quarter higher per ton of equivalent energy extracted. In particular, Soviet underground mines in 1955 had more equipment (for equivalent output) than did their American counterparts in 1954, as is evidenced by the following tabulation:[1]

Item	*U.S. Mines*	*U.S.S.R. Mines*
Power drills	11,667	50,331
Continuous mining machines	323	2,145
Other coal cutters	9,054	4,486
Electric locomotives	10,955	11,317
Conveyors	5,058	38,162

In contrast, only a quarter of the Soviet raw coal was washed, compared with two-thirds in the United States.

The Soviet Union has expanded open-cast mining, principally of lignite, from less than 5 percent of the physical output in 1940 to almost 20 percent in 1958. This lags behind American practice, wherein over a quarter of the output in 1954 was open-cast. However, the Soviets used their equipment much more intensively. In 1955, they produced 65 million metric tons from only 42 mines with 713 power shovels, 212 bulldozers, and 33 dragline excavators. In the United States in 1954, 2,305 open-cast mines produced 60 percent more by weight and 3.1 times as much by heat value. But the equipment used included 3,041 power shovels, 3,037 bulldozers, and 1,141 dragline excavators.

In the peat industry, four-fifths of the Soviet output in 1928 was produced manually or with simple hoists and presses only. By 1940, almost a third was hydraulically extracted; this method produced an excellent fuel, was safe, and required little direct labor.

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[1] The data cover only the Ministry of Coal Mines in the Soviet Union and bituminous mines in the United States, except that the American figure for conveyors is comprehensive.

Its disadvantages were the need for elaborate, fixed installations, high electric power consumption, and extreme seasonality; moreover, drying operations required almost half as many workmen as did direct extraction. By 1955, manual extraction accounted for only 12 percent of the output, whereas milling — a kind of tractor-powered harrowing — had risen from 16 to 45 percent, partly at the expense of hydraulic extraction. The new technique yields a poor product which is constantly subject to spontaneous combustion, but it requires little plant, electricity, or labor, and can continue during mild freezing.

In petroleum and natural gas extraction, two characteristics — a very low drilling rate and a consequently small number of producing wells — have persisted. In 1940, an output of 34 million metric tons of petroleum equivalent came from some 13,300 wells and was sustained by less than 2 million meters of total drilling; in 1955, the corresponding figures were 79 million metric tons, 30,500 wells, and 5 million meters drilled. At the same time, secondary recovery methods — chemical injection, hydraulic stratum rupture, gas injection, and especially, flooding via peripheral injection wells — have increased the proportion of free-flowing oil from 23 percent of all output in 1940 to 70 percent in 1958. The quantity of water injected has risen from 9 million cubic meters in 1950 to 142 million in 1958. Over-all, the new methods, though requiring substantial auxiliary equipment such as de-emulsification units, have permitted significant net economies. Another positive trend has been the increasing share of natural-gas production, which constituted 3 percent of the industry's output in 1928, 10 percent in 1940, and 17 percent in 1958. Automated oil and gas well operating systems are only now being introduced in the Soviet Union.

Soviet petroleum refining has long suffered from inadequate investment, which has never exceeded 23 percent of the oil industry's total and which has been frozen at the same absolute level since 1956 — mute testimony to the competitive pressures of the fissionable and fusionable materials industry. The effects of these ceilings have been compounded by the increasing proportion of high-sulphur crudes, which require two to three times as much capital per ton as Caucasian oils.

Quantitatively, the industry advanced considerably between 1928 and 1956, largely through the expansion of thermal cracking, based on Winckler-Koch and Houdry designs. Over this period, gasoline production rose from 750,000 to about 16.0 million metric tons; naphtha disappeared; kerosene and jet fuel increased from 1.9 million to some 12 million metric tons; and finished gas oil and light diesel fuel increased from 220,000 to around 14 million metric tons. Lubricants totaled 330,000 metric tons in 1928 and 3.0 million in 1956.

Quality has been neglected; as late as mid-1955, the basic Soviet motor-vehicle gasoline was a 56-octane fuel of low volatility. Furthermore, since distilling and cracking capacity have failed to keep pace with crude output since 1956, the current stress is on simplified refining schemes, with a minimum recovery of lighter products and a maximum of residual fuel oil. As one result, the Soviet railroads, rather than driving toward dieselization, are extending the useful lives of their steam locomotives by converting from coal to fuel oil, with subsequent economies in deadweight hauled though not in mechanical efficiency. Simplified design and operation have also meant a continued neglect of hydrogenation (in part, because of the high cost of hydrogen from obsolete production methods); high equipment corrosion because of inadequate sulphur removal; slow repair and prolonged downtimes; and inadequate mechanization for product-testing, transportation, and maintenance, which together occupy 40 percent of all Soviet refinery personnel.

In sum, Soviet development of the mineral-fuel industries has been uneven. Significant weaknesses in the distribution of output and in the quality of products are evident. But these are largely overshadowed by the tremendous rate of expansion achieved. Technological changes have also been effected, particularly in extraction. Over-all, the capitalization of the Soviet mineral-fuel industries today has reached a general level (per unit of output) comparable to the American level. In transportation facilities, Soviet outlays may well be greater; however, storage and local distribution facilities have remained minimal.

Production Costs and Economic Decisions

Expanding resources and high capitalization have not obviated rapid increases in labor requirements. In 1928, employment in the mineral-fuel industries totaled 420,000 persons, including 400,000 in extraction and 20,000 in coking, petroleum refining, and gas manufacturing. By 1940, the aggregate had risen to 1,000,000, including 900,000 in extraction; by 1950, to 1,430,000, including 1.3 million in extraction; and by 1958 to about 1,800,000, including 1.6 million in extraction. In general, the output of crude mineral fuels per extraction worker-year rose from 143 metric tons of conventional fuel (7,000 C/kg equivalent) in 1928 to 270 in 1940, and about 428 in 1958 — a productivity increase of only 200 percent in 30 years. In coking and petroleum refining, product per worker-year has risen not over 40 percent during the same period. In petroleum refining alone, even the gross value of refined products per worker-year, at constant Soviet prices, rose only 54 percent between 1928 and 1956.

Paralleling this mediocre record in productivity gains has been a notable rigidity in the structure of mineral-fuels production. In the United States, the share of petroleum and natural gas in mineral-fuel production has risen steadily from a third (in energy equivalent) in 1928 to over two-thirds by 1958. But in the Soviet Union, the share of these efficient fuels declined from 34 percent in 1928 to 22 percent in 1950, regaining the 1928 proportion by 1958 (Table 1). This structural conservatism has not merely had deleterious effects upon productivity in fuel extraction and refining, but it has also burdened the Soviet economy with excessive transportation efforts, with high fuel-handling costs, with a paucity of chemical byproducts, with air and water pollution, and with low mechanical efficiencies in prime movers, especially steam locomotives.

Examination of the production costs of the various fuels and their refined products and of their wholesale prices both in 1934 and in 1954-55 shows that, until recently, Soviet structural conservatism has contravened immediate economic rationality. In 1934, coke was selling near cost, whereas the output of coal and lignite was moderately subsidized and production of peat was heavily subsidized. In contrast, the Soviets marketed their petroleum products at an enormous profit. Nevertheless, by 1950, while coal and lignite output had risen 157 percent (in heat value) and peat 97 percent, coke had increased 92 percent, and petroleum products lagged with a 65 percent rise. In 1954-56, price-cost relationships were similar to those in 1934, but with a smaller spread between the extremes of subsidized peat and very profitable petroleum products and natural gas. Also, price discriminations by area and class of customer were severe. Nevertheless, differential growth trends in the years 1950-58 have been somewhat responsive to relative advantage. Although peat output has not declined, its growth of 47 percent has been a tenth that of natural gas. Profitable petroleum output has increased 200 percent while profitless coal and lignite production has grown 90 percent.

The pattern of Soviet performance and technique becomes most evident by comparison with the United States. Examination of the mineral-fuel industries of the two countries in the years 1939-40 and 1954-55[2] indicates the following:

(1) Over this period, Soviet crude mineral-fuel output increased 120 percent; American, 50 percent. To do this, the Soviets increased the power of installed mining equipment, including that for drilling, almost fivefold, compared with a tripling in the United States. Soviet labor productivity in extraction rose 38 percent, whereas American productivity doubled. (All data refer to conventional fuel equivalents.)

(2) On an absolute level, the power of equipment per metric ton of conventional fuel extracted matched the American both in 1939/40 and in 1954/55. In contrast, Soviet labor productivity, in metric tons of conventional fuel annually per person employed in extraction, fell from 17 to 12 percent of the American performance over this period.

(3) Within this framework, the relative efficiency of Soviet capital and labor utilization has varied widely. In general, open-cast coal mining and oil-well operations reflect strong performances, whereas underground coal mining is wasteful. Soviet exploratory and operational drilling, which has been excluded from these comparisons, is especially poor.

(4) The specific causes for less effective Soviet performance are many. They include the use of marginal resources, the prevalence of obsolete and inappropriate equipment and layouts,

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[2] U.S. censuses of mineral industries and manufactures were conducted in 1939 and 1954, whereas 1940 and 1955 are Soviet statistical base years. Hence, a slight chronological asymmetry is advisable.

the insufficient mechanization of auxiliary operations, and excessive job simplifications necessitated by low educational attainments among workmen. Conversely, Soviet performance is aided by economies of scale and by continuous, high levels of demand.

(5) Most important has been the large part played by economic substitution, exemplified by the shift from coal to oil and gas, in the American economy, and its insignificance, until recently, in the Soviet. The concept of economic obsolescence is only now being grasped by Soviet leaders.

Total Energy Supplies and Their Utilization

Granting a very rapid expansion of Soviet mineral-fuel output and the enormous real cost of the achievement, it is necessary now to evaluate the broader economic significance of these facts. What has been the role of mineral fuels in the Soviet national energy supply? How has that supply grown? How has it been utilized, and how efficiently? For all these questions a useful point of reference is American experience for the corresponding period, 1928-58.

Total inanimate energy production in the Soviet Union increased from about 105 million metric tons of standard fuel equivalent in 1928 to 290 milion in 1940, 355 million in 1950, and 675 million in 1958, an increase of 540 percent in 30 years. During this period, the share of mineral fuels rose from 50 to nearly 90 percent of the total. The growth of American energy production has been slower and has fluctuated with business cycles. It went from some 875 million metric tons in 1928 to 950 million in 1940, a peak of 1.53 billion in 1957, and a level of 1.43 billion in 1958. Mineral fuels have predominated heavily at all times.

In general, Soviet energy production has climbed from 12 percent of the American level in 1928 to 31 percent in 1940, and to 47 percent in 1958. The relative growth of energy consumption has been somewhat less rapid, since the Soviet Union, an energy exporter before the war and an importer in the early fifties, has again become a net exporter of fuels, whereas the United States, normally an exporter, was importing fuel in 1958. These adjustments reduced the U.S.S.R.-U.S. ratio in 1958 to 43 percent, a figure close to independent estimates of relative industrial output in the two countries.

Examination of the patterns of energy utilization in these countries gives an unexpected insight into their economic structures. Despite the profound differences in goals, the two economies have patterns which are not only similar but even converging over time. In the Soviet Union, the share of domestic energy taken by electric power[3] rose from 11 to 18 percent between 1937 and 1955. That of other industrial uses dropped from 43 to 37 percent, while transportation went from 16 to 17 percent, and household and miscellaneous uses from 30 to 28 percent. In the United States, the trends between 1939 and 1954 were as follows: electrical power rose from 10 to 18 percent; other industrial uses rose from 30 to 33 percent; transportation plummeted from 32 to 20 percent; and household and miscellaneous uses went from 28 to 29 percent.

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[3] That is, the fuel, in energy equivalent, consumed by power stations (except for by-product heat), plus the thermal equivalent of hydroelectricity. The allocation patterns of electricity produced have been different in the two countries, with the share of household use being negligible in the U.S.S.R.

The causes of these convergences are unclear, since the mechanisms affecting consumption have differed profoundly. In the Soviet Union, direct allocations supplemented by preferential pricing have predominated; and technology has remained rather conservative, especially in household applications, where fuelwood and kerosene are still fundamental. In the United States, technological change and economic substitution have affected every activity. Household efficiency in particular has been vastly improved, with better insulation, improved space heating, and more efficient cooking. Because of these advances both economies in resources and higher standards have been possible.

An exhaustive analysis of trends in fuel economies in the two countries is not yet possible. However, examination of three important sectors — railroad transportation, electrical power, and coking — indicates that the Soviet Union and the United States had, in late prewar years, closely similar levels of thermal efficiency. Drastic Soviet organizational and regulatory economies on the railroads offset poorer performances in the other two areas. However, by 1954-55, the Soviet performance was only four-fifths as good as the American, because of slowness in emulating new high-pressure and high-capacity steam power plants and in abandoning steam locomotives.

Soviet gains in the period 1928-40 are incontestable, although part of their price was the loss of 10 million lives in the collectivization of agriculture, which was a necessary preliminary to forced-draft industrialization. For the years 1940-58, an adjustment for relative changes in utilization efficiency reduces the effective gains upon American performance by two-thirds.

In general, it is clear that both the Soviet and American economies have been immensely dynamic, but in basically different ways. In one case, the development has been essentially linear and structurally rather conservative; in the other, qualitative changes and pulsations of output have immensely complicated quantitative trends. In production particularly, the Soviet command economy and the American market economy manifest great differences. Yet basic convergences have developed — but their economic, and especially, socio-political meaning is not known.

General Implications

(1) The output of mineral fuels in the Soviet Union, as measured in constant energy equivalents (7,000 C/kg), multiplied 12.0 times between 1927/28 and 1958, giving an average annual growth rate of 8.5 percent. This overall growth comprises three phases: 1928-40, with an average rate of 12.2 percent; 1940-50, with 3.3. percent; and 1950-58, with 9.8 percent.

The official Soviet measures of all industrial output show far more rapid rises, especially before the war. In contrast, two recent Western assessments using Soviet statistics on physical outputs, but employing nonduplicating and genuinely constant weights, fall within the indicated limits. The two, calculated by Kaplan and Moorsteen[4] and by Shimkin and Leedy,[5] differ largely in the use of earlier (1934) weights and in the inclusion of estimates for armaments by the latter. The average rates of growth are estimated, respectively, at 8.2 and 9.5 percent annually for 1928-40; 3.5 and 3.9 percent for 1940-50; and 9.2 percent, in both, for 1950-58. Although the pre-World War II estimates may need upward revision, the Western results seem generally plausible.

(2) Energy consumption in the Soviet Union increased 6.5 times between 1927/28 and 1958, yielding an annual average growth rate of 6.5 percent. Within this period, three phases may be distinguished: 1927/28-37, with an average increase of 9.9 percent; 1937-50, with an average of 3.3 percent; and 1950-58, with one of 7.7 percent. Presumably, the growth rates of the Soviet gross national product should have had a comparable history.

Comprehensive data on this subject have not yet been published. For 1927/28-37, Soviet official indexes of national income (less services) in 1926/27 "fixed" rubles claim an average growth rate of 16 percent annually. In contrast, N. Jasny's calculations in the same values, but net of Soviet inflationary *post hoc* adjustments, give an average increase rate of 8.8 percent; the same data, recalculated in 1937 prices, yield an average of only 5.1 percent.[6] For 1950-58, the Columbia-Harvard Research Group believes an average of 7 percent to be a reasonable working figure.[7]

The implied relationships are thus a somewhat slower growth of gross national product than of energy consumption in postwar years, with the lag between the two decreasing. For the United States, Dewhurst's estimates[8] indicate that national income at 1950 prices increased 1.6 times as fast as inanimate energy consumption between 1850 and 1890. Between 1890 and 1920, however, it rose only 70 percent as fast. Then, between 1920 and 1950, the earlier ratio was re-established. In consequence, cycles of relative wastefulness and efficiency have arisen in both economies; therefore, the apparent differences between command and market economies may in part reflect differences in the maturity of industrialization.

(3) Nevertheless, the development of the mineral-fuel industries between 1927/28 and 1958 does provide a model of the general behavior of the Soviet command economy. Their very rapid expansion was prepared by extensive exploration and was implemented by a

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[4] N. M. Kaplan and R. H. Moorsteen, "An Index of Soviet Industrial Output," *American Economic Review,* Vol. 50, No. 3 (June, 1960), pp. 295-318.

[5] D. B. Shimkin and F. A. Leedy, "Soviet Industrial Growth," *Automotive Industries,* Vol. 118, No. 1 (1958), pp. 48-59 and 122. The index has since been brought forward to 1958.

[6] A. Bergson, ed., *Soviet Economic Growth* (Evanston: Row, 1953), pp. 5-11.

[7] U.S. Senate, Committee on Foreign Relations, *U.S. Foreign Policy in the U.S.S.R. and Eastern Europe,* Print No. 11, 86th Cong., 2nd Sess. (1960), p. 24.

[8] J. F. Dewhurst and Associates, *America's Needs and Resources: A New Survey* (New York: Twentieth Century Fund, 1955), pp. 40-41 and 1114-15.

capitalization per ton of output approaching that of the United States, plus an increase of 340 percent in employment. The rise of these industries is a tribute to the single-mindedness and forcefulness of the Soviet regime, but the wastefulness of the Soviet economic system is likewise the result of imposed rather than autogenous goals and practices.

(4) Soviet dependence upon linear development and direct controls and American pulsed growth with its intricate displacements and ramified adaptations have produced noticeable convergences in the structure of energy consumption and have yielded similar long-term (1940-58) expansions of effective energy supplies. For the period 1970-75, the Soviets seek an energy output 30 to 40 percent higher than that of the United States in 1954 and an electrical output 60 percent higher. The current plans take into account many of the past deficiencies of command economics. They are economically and technically sophisticated, and the chances of their fulfillment are good. Under these circumstances, the absence of competent, comprehensive, and up-to-date assessments of future American energy requirements, and of the means to meet them, is not comforting.

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Development Credit Corporations and Industrial Renewal

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AT PRESENT a vast amount of time, energy, and money is being expended to attract new industry into rural and agricultural areas, primarily in the South. However, the problem of attracting industry is not one unique to the agricultural areas of the nation. It has also presented problems for the older industrialized sections. While the South has been concerned primarily with attracting new industry, the early industrialized regions, such as New England, have had to face two problems: (1) to retain what they already have in the face of stiff competition and (2) to continue to secure their share of the increased national output. The rapid pace of industrialization along with increased population has not been shared proportionately by each state. The shift in population, and consequently in markets, along with higher costs of transportation and the changes in use and sources of raw materials, have demonstrated rather clearly to many communities that they can either gain or lose in this new competition. As a result, regions, states, and communities have been forced to reappraise their own economy and provide such new opportunities as would tend to guarantee their own industrial future.

I.

New England, the cradle of American industry, is growing industrially more slowly than any other part of the country — at a rate little more than half the national average. This decline in relative importance has pointed out the shift toward new industrial frontiers and has forced New England to recognize the need for swift and decisive action. In terms of its share of total United States factory jobs, New England has been slipping since the early 1930's. Between 1947 and 1954 New England dropped from the number three spot to number four among the nine national geographical regions.

Once a predominantly soft goods region, New England is now split about equally between soft and hard goods. Although the area's employment in durable goods manufacturing since

1947 has picked up slightly, it is not enough to balance a 15 percent drop in soft goods jobs. Over-all, manufacturing employment in 1954 was down 8 percent from 1947. In the textile and aircraft industries, the loss in New England's share had been substantial — 5 percent or more. Although 1954 may be considered a recession year, manufacturing employment in the South Atlantic states was up 7 percent over 1947. It was up 1 percent in the Great Lakes area; 13 percent in the Farm West; 5 percent in the South Central; 22 percent in the South West; 18 percent in the Mountain States; and 33 percent in the Pacific States. This clearly indicates that factory employment in New England is running contrary to the national trend.

Since 1946 in Massachusetts alone, over seventy textile mills have been abandoned. These companies generally moved their operations to the South or to other sections of the country. In addition to textiles, management has found it necessary to move manufacturing facilities in the apparel, machinery, electrical, chemical, paper, and hosiery industries. This has resulted in Massachusetts dropping from seventh to eighth place in United States factory employment.

As a result of generations of small factory experience, New England has a basic mechanical heritage that no other part of the country offers. The region has a highly skilled labor force in an area world famous for its technological know-how and research. These technical resources provide some advantage. However, the region is already highly developed; manufacturing is well diversified and competition is keener than in most other sections of the nation. This keen competition alone seems to indicate that industrial growth and prosperity for New England will depend essentially upon development from within by new and expanding businesses, rather than upon attempts to attract industry from outside.

Relatively high transportation and power costs, along with the lack of raw materials, preclude New England from being a center for large mass-production industries. The region can offset these disadvantages only by getting better-than-average productivity from its industrial operations. In the years since World War II, the area does not seem to have been able to do this. Because of New England's early industrialization, the physical plant facilities of many of its industries are obsolete. The multistoried plants of the textile industries, for example, do not lend themselves to a modern, continuous-flow, production-line operation. Modern textile manufacturing techniques do not require exceptionally skilled workers. The inadaptability of a highly skilled, well-organized labor force, along with the high cost of replacing obsolete plant facilities, has made it difficult for New England to compete successfully with the newer industrial areas. These conditions, added to the fact that New England's population growth and its markets are lagging behind the rest of the nation, have provided sound reasons for action. Aware of this combination of threat and opportunity, the New England states have taken what they believe to be the necessary steps "to promote, stimulate, develop and advance the business prosperity and economic welfare" of their region. As a result of its historic development, it is not surprising to find the philosophy underlying New England's attempt to solve these problems considerably different from that of the South. Not only is the problem itself different, but the traditional conservatism and spirit of rugged individualism of New England have created a political and economic environment wherein the use of a program which would utilize state funds would be highly improbable.

II.

In recognizing the need for industrial expansion from within, it became obvious that there was a critical need for special types of equity funds which would encourage further development of small business. Because of the degree of risk involved and the inability of small and beginning firms to meet the usual collateral requirements, conventional lending agencies found it impossible to extend credit. Consequently, small and new business firms had often been prevented from realizing their full growth potential while the communities in which they were located were denied a share of the development that might have taken place.

Even though total savings are larger than ever before, entrepreneurs of today, because of the current tax structure, find it difficult to accumulate capital. High corporate taxes have made it difficult for many small but growing business firms to accumulate enough capital from earnings to carry out any significant expansion program. The rigidities of current depreciation allowances under the corporate income tax laws have further aggravated the problem. Thus, as more and more of the nation's wealth and income is placed in the hands of the government through taxation and debt financing, there is a lessening of interest in the use of private funds for venture capital where the risks involved are entirely out of line with the potential rewards.

The aggregate savings, primarily by the middle- and lower-income groups, have found their way into savings banks, insurance companies, government bonds, pension funds, and savings and loan associations. Because of legal restrictions and their own trust positions within the community, these institutions have not been able to lend money to small or unproved firms. Rather, they have been confined in their lending policies to serving the well-established, strong credit risks.

In analyzing this problem, New England businessmen and bankers realized that the basic difficulty facing small business in the area of finance was the lack of equity funds rather than of credit. Very frequently the two are confused. Having been unable to accumulate capital internally because of the tax structure, the small businessman seeks additional credit. He does this, again from the tax angle, because it is more profitable to borrow money than to sell additional stock. Interest on borrowed funds is a business deduction, whereas profits earned on capital stock are taxed before dividends. Even when the tax situation is not considered, the costs involved in a small stock issue are often prohibitive. In addition to this, many small business firms are tightly held by particular families, friends, or individuals who have fostered the industry from its very beginning and are unwilling to share the ownership, which is inherent in the sale of additional stock. It was here in this gray area between the need for credit and the need for equity funds that the remedial steps had to be taken.

III.

With these needs in mind, and recognizing that the use of state funds or credit for private use was not generally accepted, some other method of making funds available had to be devised. As a result, legislation was approved which created a structure wherein established financial institutions might pool some of their resources to spread the risk and provide loans to deserving small businesses. At the present time, all six New England states have passed enabling legislation authorizing the establishment of development credit corporations. Briefly stated, the development credit corporation is a state-wide, privately financed organization in which the resources of a state's private lending institutions may be brought together to provide financial assistance to deserving industrial ventures.

Maine was the pioneer in development credit corporations, passing the first enabling act in 1949. New Hampshire passed a similar act in 1951, and Rhode Island, Massachusetts, Connecticut, and Vermont soon followed. Today, all of these states are actively engaged in development credit operations. In Maine, the corporation emerged as the result of action taken by a group of bankers and utility executives; in Massachusetts, industrialists joined with the banks in promoting it; a governor's advisory committee was the motivating force behind New Hampshire's corporation; an electric light and power company spearheaded Connecticut's program; in Rhode Island, the Providence Chamber of Commerce led the way.

All of the New England development credit corporations were chartered under special legislation rather than under the states' general incorporation laws. Although the initial sponsorship differs from state to state, each organization, as the result of a mandate in the state charter, has emphasized its public character and thus has been widely accepted.

In general, the development credit corporations are authorized to (1) attract new industries; (2) foster industrial prosperity and growth; (3) cooperate with other agencies with similar purposes; (4) lend funds when funds are not otherwise available; (5) raise funds by borrowing from members or by selling stock; (6) buy real estate for lease, resale, or development; (7) promote the establishment of, and cooperate with, local industrial foundations; (8) acquire, hold, or sell corporate assets or evidences of corporate debt or ownership; (9) assist by research and counsel those businesses which it aids financially; and (10) return nonproductive assets to maximum productivity.

Ordinarily, the institution is an autonomous corporate unit, with powers to provide venture "capital" loans without the restrictions imposed on commercial banks. The corporation is able to extend long-term credit and equity funds to businessmen, especially those operating small businesses, whose prospects assure repayment in an enterprise of value to the community, yet one that could not fulfill the customary requirements for a bank loan. The development credit corporations are able to acquire money for lending because such funds for any one loan are secured from many contributing financial institutions and most of the risk against loss is assumed by the stockholders. Stock in the development credit corporation is sold by appealing to the public spirit of individuals and organizations who are interested in assisting the commercial and industrial growth of their area. The major portion of lendable funds is made available, not through the sale of stock, but rather from the money provided by financial institutions. Thus, there are two classes of participants in development credit corporations: (1) stockholders — those individuals or firms who supply equity funds for the industrial development corporation; and (2) institutional members — financial institutions that make available a fixed percentage of their capital and surplus to be used in the lending operation of the corporation.

In Massachusetts, the initially required funds were obtained through the sale of stock in the Business Development Corporation without resort to a broad public campaign. There were 213 subscribers, including 42 individuals and 171 businesses, even though it was clearly pointed out that dividends, while possible, were not to be expected. The 171 businesses included 67 manufacturers, 33 utility companies, and firms in such industries as construction, transportation, retailing, investment, railroads, real estate, management, insurance, and hotels. Thus, even though subscription has been rather limited and the total number of stockholders for all six of the New England development credit corporations totals roughly 700, these subscriptions represent a wide variety of interests. Simply stated, men who stand to benefit from the industrial and commercial growth of their community, along with public-spirited men who are willing to underwrite the well-being of their communities, assume the risks of the corporation through their stock subscriptions. It should be remembered that the stockholders are not banks but individuals, corporations, partnerships, or any other organization that is interested in the economic welfare and prosperity of the state. It is the equity supplied by these stockholders which provides the leverage for the bank loans which the development credit corporation is then able to utilize.

IV.

Of those financial institutions in New England eligible to lend funds to the corporations, the commercial banks are by far the most important (see Table 1). They represent 55 percent of the institutions and 73 percent of the amount available. Most of the large commercial banks in New England are members. However, only a small number of savings banks and insurance

Table 1. Actual and Potential Membership of New England Development Credit Corporations, December 31, 1957

(Dollar amounts in thousands)

Type of institution	Amount	Number
Commercial banks:		
Potential available	$14,183	378
Pledged	$10,351	209
Percent of potential pledged	73	55
Savings banks:		
Potential available	$ 8,881	342
Pledged	$ 2,541	77
Percent of potential pledged	29	23
Insurance companies:		
Potential available	$15,116	77
Pledged	$ 3,819	15
Percent of potential pledged	25	19
All other institutions:		
Potential available	$ 164	245
Pledged	$ 76	9
Percent of potential pledged	46	4
Total—all eligible institutions:		
Potential available	$38,344	1,042
Pledged	$16,787	310
Percent of potential pledged	44	30

Note: Some data on potential membership partly estimated.

Source: Federal Reserve Bank of Boston, "Development Credit Corporations," *New England Business Review*, April, 1958, p. 4.

companies are members. Connecticut bars the membership of savings banks and cooperative banks.

These institutions, designated as members and not as shareholders, provide funds up to a certain small proportion of their capital and surplus, such as 1 or 2 percent, or as defined in the corporation charter. Money is not accepted for deposit, but when funds are needed to cover a loan to business, the development credit corporation requests each member to supply its share, based on its proportion of the total commitments. Accordingly, money available for lending represents the pooled funds advanced as loans to the corporation by members, plus the capital stock which serves as a cushion for possible losses. The maximum aggregate of funds available for loan is consequently several times the amount of the capital stock.

The going rate of interest on loans made by the corporation is 6 percent, with three states having a service charge of an additional 1 percent. The margin between the cost of money and the loan rate is deemed sufficient to enable the corporation to become self-supporting. Maine, New Hampshire, Rhode Island, and Vermont have fixed member commitments at a maximum 2.5 percent of capital accounts for all institutions. Massachusetts' rate is 2 percent for national banks, state-chartered banks, and trust companies, and one-tenth of 1 percent for other institutions.

The development credit corporations are governed by boards of directors ranging from 9 to 25 members. In all cases, the majority of the board members (ranging from a simple majority to two-thirds) are elected by the financial institutions who supply most of the funds. The remaining board members are elected by the stockholders. All requests for loans are presented formally to the directors who in turn evaluate and pass on them. Because the members of the board are interested primarily in enlightened industrial growth, they frequently provide business management with advice as well as loans (or in place of loans) when the need is apparent. They ordinarily represent an invaluable reservoir of management and financial experience.

The board members usually elect officers, but in general, they have been somewhat reluctant to delegate over-all powers to the officers. Consequently, the processing of applications has been delayed simply through insistence on a tedious review by the board.

Ordinarily, the corporations have small staffs ranging from two in New Hampshire to five in Massachusetts. Stockholders and members frequently perform many of the clerical duties as a carryover from their beginnings when the work was done on a volunteer basis. Because financial institutions join the corporations as members, there is little expense in arranging for funds, as they automatically grant lines of credit.

V.

The potential customers of the development credit corporations fall into three general categories: (1) concerns which have good prospects and want to expand; (2) concerns which will begin operations within a community, provided they are able to acquire suitable facilities; and (3) concerns which, at the moment, find themselves in a marginal position and will probably go under unless strengthened.

Table 2. New England Development Credit Corporation Loans

Duration	Percent of loans	Percent of amount
Under 5 years	20	6
5 years exactly	27	36
6 to 10 years	43	51
Over 10 years	10	7
Total	100	100

Source: Information supplied by various directors of the New England development credit corporations, March 28-29, 1958.

Table 3. Purpose of Loans Made by the New England Development Credit Corporations

Purpose	Percent of total loans
Working capital	46
Equipment purchases	18
Building construction	16
Refinancing	5
New product development	12
Purchase of land	3
Total	100

Source: Information supplied by various directors of the New England development credit corporations, March 28-29, 1958.

The evidence to date indicates that the over-all policies in regard to lending follow fairly closely the traditional conservative banker's approach. Most loans are small in size. Roughly 42 percent of the loans approved are for less than $20,000; 38 percent of the loans range from $21,000 to $50,000. Those ranging from $51,000 to $100,000 constitute 13 percent, leaving only 7 percent in excess of $100,000. The great majority of the loans are of five to ten years' duration (Table 2).

In discussing the purpose for which these loans were made with some of the executive directors of the New England development credit corporations, it was difficult to secure specific figures. However, the basic statistical information concerning the purposes of the loans appears to be distributed as indicated in Table 3.

It is interesting to note that the largest loan category is "working capital." This capital allows marginal firms to survive a temporary period of financial embarrassment and return ultimately to a sound and profitable operation. By the same token, these loans could not be considered as aiding in the development of a new or expanding industry — the real reason for the existence of development credit corporations. Here one is seriously concerned with the question: Is this a hold-the-line operation, or will such loans ultimately result in industrial expansion?

Many New England firms over the years have found themselves in the marginal area of survival. Assistance from the development credit corporations has been responsible for salvaging a good number of these. When particular firms with declining sales and poor management have been facing extinction, a corporation loan, along with the commitment that there be fairly drastic changes in management, has frequently saved the day.

Perhaps a more dramatic effect of development credit corporation loans occurs when the money is used in the acquisition of capital goods. A typical example can be cited in the case of Lawrence, Massachusetts. As the result of the direct and indirect effects of the closing of a large textile mill in Lawrence in 1950, approximately 15,000 workers, or a fifth of the total work force, were unemployed. Local businessmen raised a fund to acquire the mill property and secured a 100 percent mortgage loan from the Massachusetts Business Development Corporation to renovate it. In this once-abandoned textile mill there are now approximately 6,000 workers representing twenty diversified businesses. This activity has stimulated employment throughout the area and is a good example of what suitable plant facilities will do in attracting industry.

Table 4. New England Development Credit Corporation Loans Approved to December 31, 1957, by Industry

(Dollar amounts in thousands)

Industry	Number	Amount
Manufacturing		
Fabricated metals	33	$2,977
Machinery	25	1,375
Textiles	25	1,359
Lumber	24	435
Leather	20	1,387
Chemicals	20	1,188
Food	19	2,243
Paper (including containers)	16	1,625
Electrical machinery and instruments	16	1,278
Printing	10	1,275
Multipurpose industrial parks	7	1,825
Furniture	7	286
Primary metals	5	595
Apparel	5	92
All other	21	903
Total manufacturing	253	$18,843
Nonmanufacturing	10	427
All industries	263	$19,270

Source: U.S. Senate, Committee on Banking and Currency, *Development Corporations and Authorities*, 85th Cong., 2nd Sess. (1958), p. 89.

Less sensational, yet a good example of a concern needing money for expansion, is that of a specialty food manufacturer in New England. This concern borrowed money to expand its markets outside New England. Sales were doubled within a year, and a labor force of 60 was increased to 80. Another concern, an instrument manufacturer who needed aid in expanding operations, was granted a loan and within a year doubled sales and employment.

Although the original charters do not prohibit the corporations from making loans to all types of businesses, as a matter of policy, the great majority have been to manufacturing or processing firms. Table 4 demonstrates how widely distributed the loans were among manufacturing groups. It is in the area of manufacturing that loans made by the development credit corporations will have their greatest impact upon the economy of the region.

VI.

Because of the basic similarities in operational procedures and structure of the New England development credit corporations, a report on any one state will present a typical picture. From a historic point of view, one might consider Maine, the originator of the development credit corporation. During the first eight years of the corporation's existence, 55 loans were granted totaling $1,648,500. Loans completely paid off amounted to $662,727. Partial payments on outstanding loans amounted to $167,686, leaving a balance of $777,221 of loans outstanding. Losses and charge-offs amounted to $40,915 or 2.5 percent of the loans made for the eight-year period. There is still a possibility that some of these charge-offs may be recovered.

During 1957 the corporation received fourteen applications for loans, amounting to $476,000. Seven, amounting to $281,000, were approved.

The board of directors in 1957 approved an increase in the interest rate charged to borrowers from 6 percent to 7 percent in order to provide better for operational expenses. No change was made in the rate paid to member banks because the board felt the banks are making a contribution in the public interest in supporting the work of the corporation. Operating under the assumption that the member banks are demonstrating the value of the voluntary, free enterprise philosophy of assisting new and small industry with private funds, the board has not attempted to follow the market rates closely in setting the rate to be paid to members.

Although the Development Credit Corporation of Maine is typical, there are some particular aspects of the Massachusetts corporation's operations which seem worthy of mention. This corporation, perhaps more than the others, has continued to support locally conceived and executed programs as one of their most effective methods of attracting new industries to a community. During 1957, the Massachusetts Business Development Corporation approved loans in the amount of roughly $2.7 million. Over the first four years of the program's existence, almost $4.5 million was lent in such areas as New Bedford, Fall River, Lawrence, Lowell, Milford, and Southbridge. During the same four years, the corporation (1) approved or participated in 99 loans totaling $13.9 million; (2) participated in the financing of 24 new buildings encompassing more than 1 million square feet of space; (3) lent approximately $1 million to assist business concerns to move into Massachusetts; and (4) approved ten loans that resulted in the utilization of 4 million square feet of formerly vacant buildings now accommodating more than 6,000 employees. By December of 1957 it was estimated that the total impact of the program had been responsible for approximately 15,000 jobs with an aggregate payroll in excess of $60 million. If to this is added the additional service industries required to accommodate this new employment, one has some idea of the total economic impact of the entire program.

VII.

An evaluation of these corporations to date can hardly lead to a conclusion other than that they have been successfully launched and have operated to better the economies of their respective states. Perhaps their clearest justification rests in the fact that the use of a pool of funds to supplement conventional sources has materially assisted in the creation of jobs and income in specific areas and regions.

If one keeps in mind that as of June 30, 1959, the six New England development credit corporations had approved a total of $28.8 million in loans with approximately $11.0 million outstanding; that over the past four and one-half years these corporations have experienced an average growth in loans outstanding of approximately 40 percent a year; that 118 loans out of 319 have been repaid in full; and that these corporations have to date suffered losses of less than one-half of 1 percent of their loans (Table 5), one must agree that they have been reasonably successful in meeting the need for more risk capital. Surely it creates a structure and force for business development that in many instances provides the region with a new lease on life. However, the sustained growth and prosperity of these corporations may present some strange and difficult problems.

First of all, the interest problem is a serious one. Even though, in light of the public nature of the corporations, dividend payments are not expected, there is evidence to indicate that the interest rates may have to rise. Some of the corporations, specifically Maine's, have already attached service charges, making in effect a higher interest rate. Although in the early stages the interest rate charged by members to the corporations was less than the prime rate and ranged from 2 percent to 3.5 percent, it has become the prime rate or in some instances one-fourth of 1 percent above the prime rate. This narrowing of the margin between interest charged and interest paid reduces the funds available for operating expenses, and ties the structure more than ever to the cyclical behavior of business conditions. Even if the corporations are able to hold the line here and maintain the current rate of interest charged to borrowers (6 percent plus a 1 percent service charge in some states), this does not in any manner provide for loss reserves. There are no criteria to date for the establishment of a loss ratio, and one would have to agree that the risks taken by the corporations are greater than the risks of ordinary banks. Thus, the ultimate financial success of the development credit corporation could depend largely upon the magnitude of its losses from defaulted loans. This, of course, is tied to time and the corporations have not yet weathered the pressure of a prolonged business recession.

Another fairly significant problem for the future is that of acquiring sufficient funds to meet new loan applications. According to their individual charters, the ratio of funds available from members to the capital of the

Table 5. Summary of Activities of the New England Development Credit Corporations, June 30, 1959

	Number	Amount
Organization:		
Stockholders	878	
Institutional members	328	
National banks and trust companies	221	
Savings banks	83	
Insurance companies	16	
Others	8	
Operations:		
Stock sold		$ 1,442,540
Amounts pledged by members		19,778,000
National banks and trust companies		12,754,000
Savings banks		3,003,000
Insurance companies		3,843,000
Others		178,000
Amounts called from members		9,472,603
Formal loan applications received	1,046	59,798,358
Formal applications rejected	600	26,751,509
Loans approved	406	28,811,699
Loans cancelled	108	9,190,650
Loans disbursed	319	21,188,035
Loan repayments:		
In full	118	6,879,828
On outstanding loans		3,227,551
Total		10,107,379
Losses incurred	10	102,205
Balance of loans outstanding		10,978,415
Types of concerns receiving assistance:		
Entirely new businesses	27	
Already established in state	303	
Relocations from out of state	42	
Financial commitments other than loans		47,625
Financial commitments repaid		517,000

Source: "Northeastern Development Credit Corporation's Report, Six Months Ending June 30, 1959." (Mimeographed)

corporation varies, in theory from 8 to 1 to 12 to 1. This ratio would seem to supply future leverage in untapped funds. Regardless of the number of members or amount of pledges, stock of the corporation must be sold in sufficient volume to warrant call-ups. Because the corporations have had no great success lately in the sale of stock, the call-up of pledged funds has been small. Any lack of cash for lending is definitely tied to the lack of stock sales. If the initial enthusiasm on the part of individuals and business concerns wears thin, this may present some difficult hurdles. The directors of the New England corporations seem somewhat concerned with the problem. Several of these corporations cannot utilize their pledged lines of credit fully because borrowed funds are already about eight times capital and stock — their legal limit. In Massachusetts, for example, the corporation reported May 23, 1957, that it had about $1.7 million to lend. When you consider that the Massachusetts Business Development Corporation's gross approvals between

January and November 30, 1957, amounted to $11.3 million, this does not seem to be much of a cushion. It would appear that the great majority of the loans were made in the early part of the year and that subsequent approvals would necessarily be limited. Connecticut corporation officials reported to the Northeastern Conference on May 23, 1957, that they were "trying to sell stock, and that they were near their loan limit." New Hampshire at the same time reported that a half million dollars was available for lending. Their loans, on the average, are small. Maine reported that as of March, 1957, only $209,000 was available for lending. To meet this situation, some of the states, having already experienced difficulty in selling additional stock, have been insisting that their borrowers buy stock.

There also seems to be some lack of objectivity in facing up to the reality of the high rejection rate. Approximately two out of every three loan applications were rejected. The corporations seem to imply a need for more funds, although this is never directly stated. "All we need to do is sell more stock and then this will permit us to borrow more from our members." Thus, it appears that the high rejection rate is also tied to the need for more adequate funds.

A major weakness of the development credit corporations may well be that the problems they are trying to combat are much larger than can be effectively remedied through the use of their present limited resources. For instance, in spite of the aid which the Massachusetts Business Development Corporation gave to areas of industrial deterioration, the June report of the Bureau of Employment Security of the Labor Department, as reported in the June 8, 1960, issue of the *Wall Street Journal,* lists the cities of Fall River, Lawrence, Lowell, and New Bedford, Massachusetts, among the twenty major industrial centers hardest hit by long-term unemployment. To qualify for the list a city must have had an annual unemployment rate at least 50 percent above the national average for three of the preceding four years.

Finally, there remains the question of whether or not the development credit corporations are to provide funds for plant expansion and equipment or working capital. To date, the greater portion of the loans have been for working capital, not for the purchases of new facilities.

Regardless of their future status, the development credit corporations appear to be the result of a real need for the channeling of private investment into somewhat riskier undertakings. They have to date, in a small measure at least, met this new demand by providing financial assistance at reasonable rates of interest.

The Competitive Position of Low-Grade Iron Ores

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IN THE HISTORY of mankind's use of the earth's resources, one discerns a recurring general pattern. The high-grade, easily accessible raw materials are used up first, with a minimum expenditure of labor and capital. When supplies of high-grade material approach depletion, grades of inferior value are utilized, assuming that it is economically feasible to do so. It cannot be done without paying a price. Utilizing poor or formerly inaccessible materials, reducing waste, and achieving "miracles" of applied science by which nearly worthless raw materials are converted into usable products involves increasingly complex techniques of production and refinements in processing, the consumption of ever greater amounts of energy (power), and in the case of many industrial-chemical processes, the use of large quantities of fresh water.

Almost any mineral substance one cares to name might be cited as an example of the problem of supplying the constantly growing demand for raw materials to maintain an industrial civilization. Until the first World War, nitrates came from natural deposits in Chile. Since then, no less than three major commercial processes have been developed for extracting nitrogen from the air; and nitrogen in the form of ammonia is recovered as a by-product of the coke ovens at steel mills. Chilean nitrates are now an extremely minor factor.

Sulphur is another good example. Sulphuric acid is a highly important component of modern civilization, going into the production of hundreds of items in common everyday use, from soap and paper to rubber, gasoline, and tin cans. For centuries the world's requirements for sulphur were largely met from natural sulphur beds on the island of Sicily, which enjoyed a virtual monopoly. About 30,000 Sicilians were employed in mining sulphur by hand, carrying it out of a deep open pit in sacks and baskets. They successfully resisted laborsaving technical devices even after these became available.

It so happens that sulphur can be extracted from iron pyrites, of which extensive deposits are found in Spain and Portugal, the United States, and other places. About 1880 the industrial uses for sulphur multiplied and the demand increased. The price rose and manufacturers began to make comparative cost studies. As a result, by 1900 most of the sulphur used was derived from pyrites and from such sources as copper and zinc smelting, in which sulphur is a by-product.

In 1903 the picture again changed very suddenly. A man named Herman Frasch developed a process for pumping up the immense deposits of sulphur beneath the tidewater swamps of Louisiana and Texas. Mountains of 99½ percent pure sulphur were made available with almost no labor. The sulphur mines are located along the Gulf Coast, where in twelve hours a large ship can be loaded and sent off to consuming centers. The United States became the leading producer, consumer, and exporter of sulphur. The per capita consumption of sulphur in the United States is about 75 pounds a year, and the cost at the mine is about a penny a pound. The supply is not, however, inexhaustible, and other sources must eventually be developed. In 1950 the United States shipped sulphur to 31 foreign countries, many of which could provide their own from pyrites, or as by-products of oil refineries, iron smelters, coke ovens, or from gypsum. Since, however, the American product is not only of better quality, but cheaper, they prefer to import until the day when cheap natural sulphur is gone and all our supply will come from alternate sources.

A third example is copper. At one time ore yielding less than 13 percent copper was scorned by miners; but the continued high demand for copper, because of its properties as a good conductor of heat and electricity, kept the price high and warranted processing extremely lean ores. At present, ores containing as little as one-half of 1 percent copper are being processed. Even so, an acute copper shortage is in the offing unless ore of still lower grade is utilized.

Eventually the high-grade reserves of every metal will vanish. Our requirements will be met by reducing low-grade ores, which involves high-cost operations and an enormous expenditure of energy. This prospect, of course, does not rule out the possibility of finding substitutes for scarce metals, e.g., the widespread use of plastics and glass.

I.

There is no lack of iron ore in the world. Iron is the fourth most abundant element in the earth's crust. In fact, so great is the total supply, if all grades of ore are included, that one is tempted to apply the adjective "inexhaustible." Our forefathers found iron ore in many places. Iron was once mined in almost every state east of the Mississippi River, being found in small scattered deposits in the form of limonite, or "bog ore."[1] Iron ore is generously distributed around the world. Transportation from remote points is no longer an insurmountable obstacle, nor is the technical problem of utilizing low-grade ores. The questions of where the necessary supply of iron ore shall come from and the type of ore to be utilized are basically matters of economics.

The major portion of our supply in

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[1] Louis C. Hunter, "The Heavy Industries before 1860" in H. F. Williamson, ed., *The Growth of the American Economy* (New York: Prentice-Hall, 1951), p. 175.

the United States has come from a narrow strip of land in northern Minnesota, 110 miles long and from one-half to three miles wide, known as the Mesabi Range. The first ore was shipped out of the Mesabi in 1894, and since then the miners have blasted, gouged, and excavated with great vigor. A mining company starts out with large capital assets and then proceeds to liquidate its capital as fast as it can. When the ore is gone, there is nothing left but a big hole in the ground and some secondhand mining equipment. Mining iron ore was originally a simple matter of scooping out the red earth (hematite ore) by the most efficient means available and transporting it to market. It was fortuitous for the American economy that such abundant supplies of high-grade ore were available within easy reach of the Great Lakes, which provided an 800-mile natural waterway to our industrial, steel-consuming centers. Without this combination of good ore and cheap transportation, it is doubtful whether the industrial complex of the lower Great Lakes would have come into existence. (This, of course, is one of the "ifs" in which history abounds, and perhaps leads only to idle speculation.)

In Minnesota, newspaper editorials frequently allude to the fact that iron is the sinew of war and peace and maintain that Mesabi ore was a critical factor in winning two world wars. In a sense this is quite true. The demand for Minnesota iron ore doubled during the period of World War I. After the war, the demand was relatively static, with fluctuations reflecting sensitivity to general business conditions, and particularly, of course, to the iron and steel industry. Actually, iron mining is simply one phase of the iron and steel industry, which is sensitive to activity in the capital goods sector of the economy.

Given the prevailing methods of open-pit mining and production of direct-shipping ore, that is, ore which requires no further processing before being fed into the blast furnace, the expansion or curtailment of production was a simple matter. The Mesabi Range functioned as a gigantic stockpile of raw material from which one could scoop out any quantity desired. Thus, in 1932, only 2 million tons of ore were shipped from the Mesabi. Ten years later, in 1942, after our entry into the second World War, 70 million tons were shipped.[2] The two world wars unquestionably hastened the depletion of the best ore.

How much high-grade, direct-shipping ore is left? Probably less than half a billion tons, or barely enough to fight another war of the magnitude of World War II. Shortly after the end of the war a proposal was made to the War Production Board that the federal government impound the remaining Mesabi direct-shipping ore as a national war reserve and then subsidize efforts to utilize the low-grade ores and ore which could be brought up from deep underground mines. Such a policy would have encountered all kinds of obstacles, political and economic, and nothing ever came of the suggestion.[3]

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[2] University of Minnesota, Mines Experiment Station, *Mining Directory* for 1959, Table 6, p. 252, "Iron Ore Shipments . . . by Ranges in Gross Tons."

[3] "Iron Ore Dilemma," *Fortune*, December, 1945, p. 260.

Meanwhile, the demand for iron ore in the postwar era has not diminished. Sixty million tons were shipped from Minnesota in 1952, and in 1955 (the year of peak automobile production) 65 million tons were produced. In a recent study by the United States Army Engineers it is predicted than an increased per capita consumption of steel products, together with an increased population, will increase the demand for iron ore to an estimated 200 million tons annually by 1975 or 1980.[4]

II.

So much for the demand side. As to future supply, the answer depends on a number of factors. It is fairly certain that Minnesota and the Lake Superior region in general can supply a much smaller fraction of the total. How much of the future supply will come from the Lake Superior region will depend largely upon costs. The cost of processing the remaining low-grade ore must be brought down to enable it to compete with the high-grade, direct-shipping ore being developed in Canada and other parts of the world.

Minnesota has certainly lost its monopoly on iron ore. Early miners took only the richest ore, leaving the leaner material behind. Some of the huge dumps of material seen in the area are composed of low-grade ore, the tailings cast aside from earlier mining operations. It was difficult, from a profit-and-loss standpoint, to do otherwise. The operators, who leased the mines and sold the ore in a competitive market, had every reason to mine the best and most accessible ore first, and to a lesser extent so did the fee owners who were obliged to pay annual property taxes on the unmined ore. Nevertheless, the policy of mixing lean and rich ores to achieve an average quality, and of beneficiating, or improving the quality of lean ores by screening and washing or by some more complicated form of processing, was generally accepted practice by the 1930's.

The tax burden is conceded to have deterred the practice of conservation in iron ore mining. The Minnesota tax structure with respect to iron ore is every bit as intricate as the mechanics of some of the processes developed for treating low-grade ore. There are three main types of taxes applicable to iron ore: (1) the ad valorem, or property, tax, (2) the occupation tax, on the tonnage actually mined, and (3) the royalty tax. Until recent years the citizens of Minnesota thought of iron ore mainly in terms of the tax revenues that it would yield. They refused to believe reports of depleted reserves, discounting such reports as attempts by fee owners to evade tax payments. "The ore is there but the owners deliberately fail to report its existence," it was said. In mining circles, on the contrary, it is universally believed that the taxes are and have been a crushing burden. Whether the latter view is justified or not, there is no question that taxes have been a major obstacle to the utilization of low-grade ores. The Minnesota legislature has recognized this situation to the extent of granting tax relief for developing the lowest of the low-grade ores, taconite. In other states taconite-type rock is not considered iron ore at all, but is called "iron-bearing formation" and similar names. In Minnesota it was considered worthless and not subject to property tax. During the past ten years, when the gigantic projects to develop taconite resources materialized, Minnesota's citizens have at last shown an interest in iron ore aside from potential tax revenues. Almost everyone talks about taconite with considerable enthusiasm. It is the long-range hope that it will develop into a great new industry which will continue for generations and give employment to more people than the old-time iron mining ever did.[5]

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[4] *Iron Ore Traffic Analysis* (Chicago: North Central Corps of Engineers, April, 1958), Foreword.

III.

The man who is honored as the "father of the taconite industry" is Professor Edward Wilson Davis. Dr. Davis is an electrical engineer who came to the University of Minnesota in the fall of 1912 to teach mathematics in the School of Mines. He soon became interested in the problem of taconite and thus found his life's work. Years of experiments on a laboratory scale were followed by a pilot plant in which a group of mining men invested half a million dollars. After a nightmarish period of trial and error, the promoters thought they were ready to begin commercial production, but the operation proved premature and the plant was abandoned in 1924. The product made was simply not good enough and costs were too high.[6] Meanwhile, having returned to the university, Professor Davis continued his experiments and kept interest alive in the possibilities of taconite. Finally, some twenty years later, the mining companies were persuaded to take concrete action to develop this low-grade resource on a commercial scale.

The interrelated technical and economic problems involved in reducing a chunk of taconite rock to usable ore that can be sold at competitive prices have presented a tremendous challenge. The best available knowledge of mining engineering and ferrous metallurgy has been applied and staggering amounts of capital risked on projects whose outcome no one can as yet completely foresee. The problem essentially is to take about four pounds of exceedingly hard taconite rock containing 20 to 30 percent iron scattered in microscopic crystals throughout the rock and convert it into one pound of finished product containing 64 percent iron and not more than 7.5 percent silica, which can be sold profitably at a price of 2¼ cents, more or less, delivered in Cleveland.

The problems begin at the mining site, along the range of flint-hard rock, 350 to 800 feet thick, one to three miles wide, and over a hundred miles long. A technique of drilling has been devised employing rocket-type fuel in which flaming jets burn holes into the rock. Large chunks, some the size of grand pianos, are then blasted loose. The rock is next sent through a long and complicated crushing, grinding, and screening process until the material is as fine as talcum powder or cake flour. In this form the iron particles will adhere to a magnet and can thus be separated from the rest. But the process of magnetic separation and concentration is by no means as simple as it sounds, nor is the further process of agglomeration by which the powdery substance is made into pieces of suitable size, physical structure, and chemical composition for purposes of shipping and meeting blast furnace requirements. The end product, depending on the process employed, is in the form of pellets, sinters, or nodules. The result is not an ore in the ordinary sense of the term, but a manufactured product of superior quality.

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[5] See State of Minnesota, *Supplementary Report of the Legislative Commission on the Taxation of Iron Ore* (Minneapolis: 1959).

[6] The Masabi Iron Company plant at Babbitt could easily make a product with 60 percent iron content and 15 percent silica, but the market demanded 64 percent iron and 9 percent silica. Information from Dr. E. W. Davis.

The installations required for processing taconite are very large and costly, and consume great quantities of water and electric power. United States Steel's pilot taconite plant near Mountain Iron, Minnesota, with an annual output of only 900,000 tons, consumes as much electricity as all of Duluth's 25,000 residental dwellings, and considerably more water.[7] Erie Mining Company has invested $300 million in a full-scale plant with a capacity of about 7.5 million tons annually.[8] Its facilities include a railroad, a harbor, and a power plant with a rated capacity of 150,000 kilowatts (more than the quantity consumed by the cities of Duluth and Superior). The company has built a modern city, Hoyt Lakes (about 3,000 inhabitants) in the wilderness; and to meet the requirements for fresh water it has erected a large pumping station between two sizable lakes and a dam to raise the water level of one of the lakes by thirty feet.[9] Reserve Mining Company, owned jointly by Republic Steel and Armco, has invested about $250 million in its plant at Babbitt and Silver Bay, with about the same capacity as the Erie Mining Company project. Plans for major expansion of existing facilities have recently been announced, involving a further investment of $100 million.[10]

IV.

Apparently some of the steel companies are convinced that the investments in taconite will repay their cost. Let us examine for a moment the economics of the situation. These projects can hardly be classed as mining. The raw material itself is virtually worthless. The value is added by expensive manufacturing processes and is a year-round operation. Production is limited only by the size of the plants. The danger is that during a period of weak demand the industry would be saddled with high fixed costs and idle plants. When the scheme for a national stockpile of high-grade iron ore to meet a third world war emergency was being debated, Professor Davis recommended that the federal government subsidize the infant taconite industry and set aside a stockpile of taconite pellets. This would provide a guaranteed market for many years and remove a major fear from the minds of prospective taconite investors. The investment per ton of annual production is in the neighborhood of $60. Thus, if the output of taconite is to reach 40 million tons by 1975, as some predict, it would mean an outlay of $2.5 billion. It is small wonder that steel companies have given much thought to alternate sources of supply.

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[7] Brochure entitled *This Is Pilotac: An Experimental Taconite Plant* (Duluth: Oliver Iron Mining Division, United States Steel Corporation, 1959).

[8] Erie Mining Company, managed by Pickands, Mather and Company, is owned by Bethlehem Steel Corporation (45 percent interest), the Youngstown Sheet and Tube Company (35 percent), Interlake Iron Corporation (10 percent), and the Steel Company of Canada, Ltd. (10 percent).

[9] Brochure entitled *Erie Taconite* (Hoyt Lakes, Minnesota: Erie Mining Company, 1959).

[10] Minneapolis *Morning Tribune*, April 8, 1960, p. 1. An excellent account of current steel industry plans for expanding pelletizing facilities appeared in the *Wall Street Journal*, July 20, 1960, pp. 1 and 14.

Immediately after World War II, the steel companies began a "Great Iron Hunt" and succeeded in finding supplies of high-grade ore in foreign countries. United States Steel Corporation quietly staked its claim to a mountain of iron in Venezuela, called Cerro Bolivar. Two thousand feet high and eleven miles long, it is allegedly one of the finest iron ore deposits in the world; but getting it out involves a 90-mile rail haul, a long barge trip down the Orinoco River, and shipment via ocean vessels to steel-consuming centers in the United States. Over 8 million tons of ore were shipped from this mine in 1957.[11] Other companies, principally Bethlehem Steel, are developing iron ore deposits in Brazil, Chile, and Peru. The Hanna Company has made investments in Brazil, where the largest untapped reserves in South America are located. Republic Steel has ore properties in Liberia, Africa.[12]

The most extensive developments have been in Canada. The Hanna Company of Cleveland, headed by George M. Humphrey, former United States Secretary of the Treasury, took the lead in opening up the huge ore deposits in the Labrador-Quebec region. Considerable daring was evident on the part of the companies willing to invest, or gamble, $300 million on the building of a 360-mile railway through the wilderness, on hydroelectric power plants, on port and loading facilities, and in preparing the mine itself, especially since the project was undertaken in 1949 before the outcome of the St. Lawrence Seaway controversy was known. The first shipment of ore was made from Seven Islands, on the St. Lawrence River, on July 31, 1954. Production in 1957 was 13 million tons. This ore is not only high-grade from the standpoint of iron content but is low in silica — averaging about 7 percent.[13]

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[11] U. S. Army Engineers, *Iron Ore Traffic Analysis, op. cit.*, p. 11.

[12] State of Minnesota, *Supplementary Report of the Legislative Commission on the Taxation of Iron Ore, op. cit.*, p. 37. More complete and detailed information concerning investments in foreign iron ore by steel companies in the United States is presented in the United States Tariff Commission, Report No. 35, *Iron Ore* (Washington: March, 1959). See also the following papers presented at the Twenty-First Annual Mining Symposium, University of Minnesota, Minneapolis, January 12-13, 1960: Horace T. Rens and Sumner M. Anderson, "Iron Ore in South America," *Proceedings*, Sec. C, pp. 1-13 and maps; G. A. Gross, "The Iron Ranges and Current Developments in New Quebec and Labrador, Canada," *Proceedings*, Sec. B, pp. 1-17 and maps.

Meanwhile, United States Steel is developing ore properties around the Mount Wright-Mount Reed area in Quebec, including the largest concentration plant in the world (for processing medium-grade ores) and a 193-mile railroad line to Port Cartier on the St. Lawrence. An output of 20 million tons a year is contemplated. Other sizable Canadian operations are in the Michipicoten district on Lake Superior north of Michigan. The Steep Rock mines, in Ontario just across the Minnesota border, are leased to Inland Steel and other companies. Inland Steel's $50 million outlay there is expected to produce 3 million tons annually. Pickands, Mather and Company and Youngstown Sheet and Tube, among others, are tapping the iron deposits in the Wabush Lake area, and will bring the ore down to Seven Islands.[14]

The St. Lawrence Seaway facilitates the movement of foreign ores to the established steelmaking centers in the Central and Great Lakes area, where 75 percent of United States steelmaking capacity is located,[15] and gives them a new lease on life. Fears were sometimes expressed that when Minnesota ore became depleted the steel mills would be abandoned. The outlook is that these mills will receive their future supply largely from Canada and Minnesota, whereas the mills on the Atlantic Coast (e.g., Bethlehem Steel's plant at Sparrow's Point, Maryland, and United States Steel's plant at Morristown, Pennsylvania) will draw on South America. The inland steel mills are geared to obtain most of their ore from the Lake Superior district. They have made sizable investments over the years, which factor alone will undoubtedly influence their decision as to where their future ore supplies will be obtained. Thus, taconite will probably not be produced for sale in the open market, but will be in the nature of captive operations supplying existing steel mills. Nevertheless, there are narrow limits within which the competitive advantage of taconite begins to be outweighed by price considerations. The opening of the Seaway further undermined the competitive advantage of Minnesota's low-grade ores. The ingress of finished and semifinished steel products manufactured in Western Europe tends to make American steelmakers more cost-minded, and has been used as an argument against wage increases.[16] Meanwhile, the alternative of importing cheaper foreign iron ore via the Seaway offsets to some extent the possibilities inherent in taconite.[17]

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[13] U. S. Tariff Commission, *Iron Ore, op. cit.*, pp. 60-61.

[14] State of Minnesota, *Supplementary Report of the Legislative Commission on the Taxation of Iron Ore, op. cit.*, pp. 25-26.

[15] Steelmaking capacity in the Central and Great Lakes area is divided as follows: Chicago-Gary, 29 percent; Cleveland-Detroit, 14 percent; Pittsburgh-Youngstown, 47 percent; Buffalo, Erie, and Johnstown, 10 percent. See *Iron Ore Traffic Analysis, op. cit.*, p. 55.

[16] Article by Roger M. Blough, chairman, United States Steel Corporation, in *U. S. News and World Report*, Vol. 48, No. 3 (January 18, 1960), p. 54.

[17] A study made by the Federal Reserve Bank of Minneapolis reveals no serious apprehension on this score since the Seaway

The threat of foreign ores is a very tangible one, and is made worse by the fact that the silica content of foreign ores is generally very low — in some cases unbelievably low when compared with the Minnesota ores. The presence of silica is the chief drawback in the use of taconite. Silica is an extraneous material unwanted at the blast furnaces and has to be eliminated. What the chemist calls silica, the layman calls sand; but to remove the silica from iron ore is not a simple matter of sifting out sand, for it is a part of the molecular structure of the ore.

Unfortunately for the Minnesota producers, the blast furnace operators have become increasingly discriminating. At one time it was believed that a product containing 61 percent iron and 12 percent silica would be satisfactory. "Such a grade now would be entirely unacceptable."[18] From 1940 to 1954, quantity rather than quality was the criterion, and the average silica content of ore shipments increased to 10.4 percent. In 1955 pressure was put on the miners to ship ore with not more than 10 percent silica. More recently processors have insisted on a maximum of 8 percent silica, and that is difficult to achieve.

The steelmakers have been calculating costs with sharp pencils and have discovered the operating economies gained from the use of high-quality raw materials. This applies equally to all the raw materials which go into steel production. Typically, about 960 pounds of limestone, 1,930 pounds of coke, and 3,870 pounds of iron ore are required to make one ton of pig iron. In the latest revised edition of the manual on steelmaking, this subject is given considerable emphasis: "Any improvement in physical form and properties as well as enrichment" of the raw materials will, according to the manual, lower costs. "Beneficiation of all raw materials has received much attention and many credit these efforts as important factors in raising the output of furnaces and in lowering the cost of production."[19] The more silica in the ore, the more limestone and coke are required, which raises the cost. It is evident that steelmakers are making steel "by the book," i.e., according to manuals on ferrous metallurgy; and the pressure is on producers of raw materials to conform.

V.

The foregoing discussion clearly points to the fact that the iron ore producers in Minnesota are encountering the problems inherent in the transition from the exploitation of a high-grade natural resource to the utilization of lower-grade materials. By means of advanced technology, enormous consumption of energy and water, and heavy fixed capital investments, a continual supply of a vital mineral can be

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is a factor in preventing the shift of steelmaking capacity from the Central and Great Lakes regions. See "The Seaway and Iron Ore," *Monthly Review,* August, 1960, pp. 3-8.

[18] Statement of Fred Devaney, director of metallurgy and research for Pickands, Mather and Company, in State of Minnesota, *Supplementary Report of the Legislative Commission on the Taxation of Iron Ore, op. cit.,* p. 50.

[19] United States Steel, *The Making, Shaping, and Treating of Steel* (7th ed.; Pittsburgh: 1957), p. 259.

wrested from the raw materials available. Meanwhile, the situation is complicated by economic considerations, among which is the availability of new sources of supply of high-grade ore from remote corners of the earth. Developments in transportation have made these accessible; but political considerations (there are those who remember the fate of foreign investments in Mexican oil properties not to mention the recent Cuban experience) indicate a degree of caution, which in the long-term view, helps to make the Minnesota taconite look more attractive as an assured source of supply for the future.

Changing Determinants of International Migration: A Review Note

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THE INTERNATIONAL LABOR OFFICE has published a broad survey of international migration in the period 1945-57.[1] Nearly a third of the text is devoted to political migration — the forced transfers of people which have been such a grim feature of the world scene in the last fifteen years. In this section special attention is given to the influx of refugees into Western Germany and Israel. The second part of the volume covers continental and intercontinental movements, changes in laws and regulations, labor demand and supply throughout the world, organized and assisted migration, and the demographic economic and social effects of migration on sending and receiving countries. Much use has been made of unpublished ILO material and a great deal of information was obtained from countries' replies to the annual questionnaire sent out by the office. Useful bibliographical references are appended to each chapter. The project has been admirably executed; in 400 pages we are given a clear and comprehensive account of migration movements throughout the world, with a judicious blend of statistical facts and analytical comment.

In some ways what happened in Western Germany is one of the most striking examples of mass immigration on record. By the end of 1946 the territory which was to become the Federal Republic had absorbed 7 million refugees and by the end of 1957 another 4½ million had arrived. The population increased by one-third in twelve years. The first great inflow swept into an economy which was completely dislocated and battered by total military defeat; there was an extreme shortage of capital and monetary stability was in great danger. However, in a little over a decade the country which had been ruined by war and then had taken on what appeared to be a colossal burden of refugees had become one of the fastest-growing economies in the world with gold and dollar reserves larger than those of Great Britain.

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[1] *International Migration 1945-1957,* ILO Studies and Reports, New Series, No. 54 (Geneva: 1959), pp. xiv, 410. $4.

Up to 1948 rigid controls were in operation. Then came the reform of the currency and a policy aimed at maximizing the rate of capital formation. Between 1949 and 1957 the gross national product in real terms went up by 85 percent, and even by 1955 private consumption was 55 percent higher than it had been six years before. Unemployment fell from over 10 percent to 3 percent. In explaining how all this was achieved, the ILO book stresses the unique features of the case and concludes that "the experience of the Federal Republic of Germany during the post-war years — in spite of certain similarities with that of other countries which at one time allowed uncontrolled immigration—affords no basis for over-optimistic conclusions as to the impact of mass migration on high-productivity economies in general" (p. 34). The reasons given for this view are that the enormous military losses would have made it essential to recruit a large number of male immigrants in any case, that the refugees included a high proportion of skilled labor and highly qualified personnel, that wartime destruction of equipment had to be repaired, and that the refugees were prepared to endure great social hardships.

One is not convinced by this thesis. Of course the circumstances were extraordinary, but the economic process of absorption was singularly reminiscent of what happened during past waves of immigration in, for example, the United States or Canada. The refugees spoke the same language and had the same background as the people in the receiving country, and so they were highly adaptable and mobile; the pressure in the labor market made the trade unions docile and kept down the level of real wages; the new labor was received into an economy with an advanced level of industrial techniques; and this huge supply of cheap labor induced a "widening" of the capital structure with potent effects on the growth of productivity. All these features were characteristic of the great inflows of migrants into the United States. One would have liked to see an analysis of the way in which the influx into Western Germany affected the technical coefficients of production. One feels that in this respect a strong parallel with past experience would emerge, but it does not necessarily follow that the same could happen in every advanced economy at the present time. Where the German case is different from the mass immigration of previous periods is in the prominent part played by the state, for example in planning appropriate flows of internal migration. Three large schemes of population transfer were organized by the federal government to relieve provinces such as Schleswig-Holstein, Lower Saxony, and Bavaria; over 1 million people were affected. Moreover a special bank was set up to give long-term loans to refugees who had previously been entrepreneurs or self-employed so that the community could benefit from their skills. The Equalization of Charges Act of 1952 provided for the use of public funds to compensate refugees and other war victims for their capital losses. The state was active in creating the conditions under which the rate of growth of investment could be maximized.

The transfer into West Germany was part of the tremendous world-wide problem of refugees. Between 1947 and 1951 the International Refugee Organization resettled no less than 1,038,700 refugees, 32 percent of them in the United States, 18 percent in Australia, 13 percent in Israel, and 12 percent in Canada. After 1951 the work was continued by the Intergovernmental Committee for European Migration (ICEM), under whose auspices 249,100 people were resettled between February 1, 1952, and December 31, 1957. Of these, 36 percent were received by the United States, 20 percent by Canada, 13 percent by Australia, and 9 percent by Israel. These figures of course do not include movements made without help from international agencies.

One of the most interesting chapters in the ILO study is a summary account of labor demand and supply throughout the world. At first sight it would seem impossible to reduce this complex phenomenon to meaningful terms, especially in a period when population movements ceased to be the prominent factor in economic growth which they were up to the 1920's. The method adopted is to examine the factors affecting the demand for migrants in each continent and the conditions of supply in the traditional sending countries. For Europe the analysis of the demand side is limited to five countries — Belgium, France, the United Kingdom, Sweden, and Switzerland — where vigorous economic development coupled with a virtually static labor force created a demand for unskilled manpower from outside. Western Germany was left out of this picture, presumably because it had already been dealt with under "political migration." This unfortunate omission has distorted the analysis. National labor markets in Europe are closely interrelated; the West German labor force grew from 19.3 million in 1946 to 25.2 million in 1957 and the economic interaction of this on the rest of the continent cannot be overlooked merely because the transfer had political causes.

The distribution of European emigrants by continent of destination shows that North America is still the major recipient, taking 2,900,000 people, or 44 percent of the total of 6,600,000 in 1946-57. The ILO book concludes that in the United States "the restrictive laws governing overseas immigration have reduced the total figure to a far lower level than it might otherwise have reached. The recent development of immigration from Mexico and Central America does not appear to have offset the restrictive effects of the quota system applied to overseas immigration, even as modified by emergency legislation" (p. 237). It recognizes, however, that for a variety of reasons there is no prospect of an early return to large-scale immigration. In Canada, Australia, and New Zealand, recruitment of outside labor is still a vital part of the process of economic growth.

The ILO analysis rightly draws attention to the following point about the main determinants. ". . . the relationship which used to exist between international movements of labour and movements of capital — or, more specifically, between European overseas emigration and capital exports from

Table 1. Net U.S. Capital Outflow into Direct Investment Abroad, by Area, 1946-59
(Millions of dollars)

Year	Total	Western Europe	Canada	Latin America	Other countries
1946	230	23	47	71	89
1947	749	46	39	457	207
1948	721	64	88	333	236
1949	660	36	100	332	192
1950	621	119	287	40	175
1951	528	62	240	166	60
1952	850	−8	420	277	161
1953	721	51	387	117	166
1954	664	50	385	88	141
1955	779	140	300	193	146
1956	1,859	486	542	592	239
1957	2,058	254	584	1,086	134
1958	1,094	173	398	288	235
1959	1,204	439	427	193	145

Source: U.S. Department of Commerce, *Survey of Current Business*, November, 1954, pp. 8-9; August, 1956, p. 21; September, 1958, p. 19; August, 1959, p. 31; March, 1960, pp. 18-19.

Western Europe, and primarily the United Kingdom — has largely disappeared. . . . The accession of the United States to the position of chief purveyor of capital, formerly held by Western Europe, has given rise to a sort of triangular pattern, in place of the old parallel movement. Thus Canada and Venezuela have been developed in part thanks to a combination of American investment and European immigration; Western European economic recovery has been helped by United States capital as well as by certain migration currents; and this same capital has contributed to the promotion of investment by certain countries, chiefly the United Kingdom and France, in areas outside Europe, particularly Africa — a process which . . . has been accompanied by substantial emigration. However, in spite of the importance of such movements of American capital, they can hardly be said to bear the same fundamental relationship to migration currents as the flow of Western European capital overseas did in an earlier day" (p. 264).

It is from this basis that any interpretation of the postwar mechanism must start, but we must go on to recognize the profound change in the world economy in the fifties. We should divide the postwar period into two phases with a turning point around 1952. In 1946-52 the triangular pattern was pivoted on the massive export of *public* capital from the United States to Western Europe; this flow of public investment was the prelude to the remarkable growth of productive capacity and competitive power in Western Europe in 1952-60.

The prospect of rapid growth in the European market led to a shift in American *private* investment to Europe. In the early postwar years the American private investor paid hardly any attention to Europe, but in the last few years there has been a striking transformation, as is shown in Table 1.

These figures show the net flow of

Table 2. Total Funds of U.S. Direct Foreign Investment, by Area, 1957 and 1958

Area	1957		1958	
	Dollars (Millions)	Percent	Dollars (Millions)	Percent
Canada	1,506	24	1,248	24
Latin America	2,239	36	1,395	27
Western Europe	1,241	20	1,211	24
Other countries	1,304	20	1,297	25
Total	6,290	100	5,151	100

Source: U.S. Department of Commerce, *Survey of Current Business*, October, 1959, p. 19.

funds from the United States into direct investment abroad; they cover only a part of total foreign investment activity which comprises in addition resources generated internally by foreign branches and subsidiaries of United States companies as well as money obtained from foreign capital markets. However, the net flow of capital from the United States has some interesting features. In 1946-49 the proportion of the total net outflow which went to Western Europe was only 7 percent; in 1959 the proportion was 37 percent. One reason for the change is the sharp decline in new investment in petroleum in Latin America from the peak of 1957. In 1959 for the first time Western Europe attracted more of the new United States funds for direct investment than either Canada or Latin America.

The Department of Commerce has recently begun to publish detailed statistics on the aggregate sources and uses of capital flowing into United States direct investment abroad; these comprise not only the net outflow from the United States but also internal financing by the foreign branches and subsidiaries and capital raised abroad.[2] The results of the first two surveys reveal that the total funds available to foreign subsidiaries and branches of United States companies amounted to $6,290 million in 1957 and $5,151 million in 1958. Table 2 shows the geographical distribution.

Between 1957 and 1958 the proportion of the aggregate resources used in direct foreign investment in Latin America fell from 36 percent to 27 percent, whereas the share of Western Europe rose from 20 percent to 24 percent. The figures for petroleum appear in Table 3.

In the recession of 1957-58 total resources absorbed by direct investment in petroleum abroad declined by nearly a quarter (from $3,886 million to $2,966 million); Western Europe was the exception in showing an absolute increase (from $570 million to $619 million). There was a striking shift in the distribution by area; the share of Latin America fell from 38 percent to

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[2] The data are provided by a sample of 290 U.S. companies, representing the accounts of over 1,500 foreign enterprises; they account for about four-fifths of the earnings of all direct foreign investments in the industries covered. See *Survey of Current Business*, January, 1959, pp. 20-24.

Table 3. Total U.S. Direct Investment in Petroleum, by Area, 1957 and 1958

Area	1957		1958	
	Dollars (Millions)	Percent	Dollars (Millions)	Percent
Canada	705	18	578	19
Latin America	1,478	38	738	25
Western Europe	570	15	619	21
Other countries	1,133	29	1,031	35
Total	3,886	100	2,966	100

Source: U.S. Department of Commerce, *Survey of Current Business*, October, 1959, p. 19

25 percent and that of "other countries" from 29 percent to 25 percent, whereas that of Western Europe rose from 15 percent to 21 percent. The latter indicated a marked expansion in refinery capacity in European countries. When the results of the third survey of direct investment are published, it will be possible to extend this comprehensive analysis to 1959. We cannot yet be absolutely certain that a new trend is asserting itself. If we take the book value of United States direct foreign investment in various parts of the world in 1952 and 1958, we get the rates of growth shown in Table 4. One thing seems to be clear. The remarkable rate of growth in the European Economic Community, where industrial production increased by over 50 percent between 1953 and 1959, is exercising a strong pull, and the operative factor is the high expectation of an expanding market rather than relatively low unit labor costs.[3] American private investment in Europe is now on the way to taking the place of the previous flow of public loans and grants for reconstruction. However, the inflow of American *public* capital to Western Europe has continued on a big scale in the form of military grants and expenditure; in 1958 these amounted to $3.4 billion, and the total of public capital exports to all countries came to $8.5 billion.

Table 4. Rates of Increase in Book Value of U.S. Direct Investment, 1952-58

Area	Percent increase
Western Europe	104
Africa	98
Canada	84
Latin America	60
Middle East	58

The *governmental* part of the present influx of American capital to Europe is dictated by the grim necessities of the cold war. The confluence of large private and governmental transfers is part of the cause of the surpluses piling up in Europe, especially in West Germany, which are the obverse of the deficit in the United States balance of payments. This deficit cannot continue indefinitely at the 1959-

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[3] See Eugene A. Philipps, "American Direct Investment in West German Manufacturing Industries, 1945 to 1959," *Current Economic Comment*, Vol. 22, No. 2 (May, 1960); and Brinley Thomas, "Recent Trends in American Investment in Western Europe," *The Three Banks Review*, September, 1960, pp. 3-21.

60 rate. Corrective measures will have to be taken on both sides of the Atlantic, the major responsibility in Europe lying on the shoulders of West Germany. If the required equilibrium in United States payments can be achieved only at a lower level of international trade, it is bound to have unfavorable reactions on international mobility. If the United States has to apply deflationary pressure for balance-of-payments reasons, she will lose the freedom which she has enjoyed through her liquidity; a contraction in United States demand for raw materials might have a serious effect on the primary-producing countries and this in turn would have a depressing influence on the demand of the latter for migrants.

The short cycles in direct investment abroad have been synchronous with, but of much greater amplitude than, the cycles in domestic investment in plant and equipment in manufacturing in the United States. For example, new funds going into direct investment abroad declined from a peak of about $1 billion in the second quarter of 1957 to less than $200 million in the first quarter of 1958. There may well be a recession in the United States within the next year or two, and if meanwhile the monetary reserves have continued their recent fall, it may not be feasible for the Federal Reserve authorities to lower interest rates enough to speed recovery lest it should induce a large outflow of gold. If therefore the recession were to be severe, the impact on direct foreign investment would be all the more serious, and this would be communicated to the most vulnerable parts of the international economy. In such circumstances the prospects for international migration would be gloomy.

The ironical feature of the present situation is that the high level of American exports of public capital for mainly military purposes is threatening the viability of the triangular mechanism which owes its origin to the previous flow of exports of public capital for European economic recovery. If in a dangerous international situation it is impossible to reduce foreign military expenditures and grants, concerted measures must be taken in Europe as well as the United States to cope with the balance-of-payments problem without sacrificing the impressive gains to the world economy in the last ten years.

Books Reviewed

Integration and Competition in the Petroleum Industry. By Melvin G. De Chazeau and Alfred E. Kahn (New Haven: Yale University Press, 1959. Pp. xviii, 598. $7.50)

The petroleum industry in its various economic aspects is probably more widely discussed than any other industry, foreign or domestic. Nonetheless, additional contributions of merit are welcome not only because there remain unsolved controversial issues of public policy but also because the changing nature of the industry requires continuing investigation by economists, public agencies, and others interested in the development of policy in this highly significant area of industrial activity.

The study under review should go far toward allaying three suspicions which are commonly entertained by the more cynical among us. First, it is demonstrated beyond question that sponsorship of scholarly inquiry by private industrial sources need not stand in the way of academic freedom and objectivity. Second, it is clear that the tools of economic analysis are sufficiently sharp to enable scholars, by study rather than by direct experience, to obtain meaningful insights into the issues which surround the operations of a complex industry. Third (although this is not the major emphasis of the study), there should no longer be any doubt as to the ability of antitrust action to affect significantly in desired directions both the structural and behavioral dimensions of a specific industry. (One may, of course, continue to question the wisdom of particular actions which have been brought or are contemplated against the petroleum industry.)

As the title indicates, the main interest of the authors is centered on the relationship between integration and the extent and nature ("workability" if you will) of competition in the industry. Although horizontal integration has been widespread among the major petroleum companies, the structure of the book indicates that primary emphasis is here placed on vertical integration through the various stages of crude oil production, transportation, refining, and marketing of final products. Considerable attention is devoted to discovering the strategic and economic advantages of the fully integrated firm as it operates at the different stages, and the possible disadvantages at each level which are incurred by the nonintegrated or partially integrated firm. Although both the advantages to the one and disadvantages to the other are frequently real and serious, the authors rely on the absence of a trend toward higher concentration and the strength and vigor of open markets at the latter stages to conclude that, beyond the production of crude oil, the basic structure of the industry remains "essentially competitive." It is demonstrated that, except for the pricing of crude oil, "managerial policy and administration have only limited effectiveness."

Although the authors therefore oppose divestiture proceedings as a desirable element of public policy, they are by no means sanguine in their attitudes toward the integrated firm. For instance, in the discussion of the transportation stage of the industry, it is argued that pipeline ownership, by virtue of the power that it conveys to the integrated firm, "must be subject to public scrutiny and public control." It is recognized, too, that

> the combined size and integration of the major oil companies have impaired the competitive position of the nonintegrated and the small, less integrated refiners beyond technical handicaps attributable to differences in the efficiency with which they serve the public.

Opposition to divestiture is influenced strongly by the authors' conviction, often reiterated, that such monopoly power as is exercised by the industry rests essentially on publicly imposed prorationing and import controls over crude oil which have given the largest firms in the industry "a powerful sergeant-at-arms — too powerful for workable competition." In an excellent chapter, the authors present a convincing case for mandatory unitization of domestic pools and free imports of crude oil from abroad. It is later argued that even if the integrated refiner is permitted to operate crude oil properties, there is a sufficient number of independent producers, refiners, and marketers so that freeing crude oil production from its tie with expected market demand would yield a condition whereby "vertical integration would be forced to justify itself in terms of its comparative efficiency in competition with nonintegrated or partially integrated forms of business organization." Thus the authors look not to antitrust but to a reversal of adopted policies which are in contradiction to the objectives of antitrust as the means of eliminating monopolistic practices and profits from the industry.

It is most interesting to observe that the analysis of significant issues is conducted within the framework of the concept of workable competition, and that ultimately the authors rely on performance standards by which to judge the workability of competition in this particular industry. A reviewer cannot be expected to overlook the fact that one of the best-known critiques of the performance test, which appears to deny the validity of such an approach, is to be found in an earlier work of which one of the authors of the present study was also co-author. I refer, of course, to Joel B. Dirlam and Alfred E. Kahn, *Fair Competition: The Law and Economics of Antitrust Policy* (Ithaca: Cornell University Press, 1954), pp. 35-44.

William H. Martin

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Management in the Industrial World: An International Analysis. By Frederick Harbison and Charles A.

Myers (New York: McGraw-Hill, 1959. Pp. xiv, 413. $7.00)

With the growing interest in the process of development and the consequent invigoration of work in economic history, there has been an increasing awareness of the fact that there is no single road to industrialization — that to some extent each society follows its own path, a path determined by the resource base, the timing of the process in relation to other regions, and the social structure. Nevertheless, it seems equally clear that as a region industrializes there are certain basic general preconditions that must be satisfied and certain general consequences that must be anticipated. The acceptance by scholars of this pattern of diversity within similarity has led to a resurrection of comparative studies of the process of industrialization. One of the most productive groups engaged in the comparative analysis of the process of modernization is the Inter-University Study of Labor Problems in Economic Development. This volume is another product of that enterprise, tracing "the logic of management development as related to the processes of industrial growth."

The theme of the book is simple. As an economy modernizes, its economic organization necessarily becomes more complex. There is need for greater and greater specialization of function, technical and administrative. The book explores the changing nature and scope of managerial activities at different stages of modernization. In order to show both the different scale of management resources required at different stages in the industrialization process and the variations in management philosophies and organization possible at any one stage, the book is divided into two parts. There is a general essay of about 130 pages and twelve very brief country studies (of India, Egypt, Chile, Israel, France, Italy, Japan, Germany, Sweden, Britain, Russia, and the United States) which are intended to provide comparative materials.

The authors have restricted themselves to a consideration of the management characteristics and problems of large-scale industry. They consider "managerial resources" not only as an economic factor but also as a system of authority and as a class. On the whole, the authors conclude, "There is a general logic of management development which has applicability both to advanced and industrializing countries in the modern world" (p. 117).

As a factor of production, management, like capital, must be accumulated and directed into the most productive activities. "There is a direct relationship between the quality (and quantity) of the managerial organization and the productivity of labor . . ." (p. 118). However, there is a confusion that persists throughout the main essay. On the one hand the authors claim that the successful generation of management skills is the cause of industrial progress; on the other they contend that it is merely a necessary condition of the process of industrialization.

The authors explore management as a system of authority, pointing out that as industrialization proceeds organization becomes more complex and management can no longer remain in the hands of the individual or family but must become the province of persons selected for skill and competence. Decision-making and administration must also become more decentralized. At the same time, management can no longer exercise complete authority over its resources (including the work force). The State, political parties, trade unions, and other groups begin to restrict the power of management to make its own rules. Here the authors run into the problem of separating the consideration of the management of a single plant, firm, or enterprise from the wider management of the economy. This difficulty is particularly visible when the Soviet and other planning economies are considered. The problem arises out of the attempt to treat management in very broad terms. Another source of confusion stems from the failure to sustain the distinction between technicians, middle-administrators, and the key decision-makers. Fuzziness is an inevitable consequence.

The authors next treat management as an elite group, pointing out that as industrialization proceeds the initiating group tends to be diluted by the growing requirements for managerial skills of various sorts. The elite ceases to be patrimonial or political in origin and becomes increasingly a group into which specialized training is the channel of entry. Given the assumption that managerial skills are causal in the industrialization process, the authors come forward with a rather provocative proposition.

> If one looks upon education as *an investment* in developing the most critically needed human resources [rather than as a consumer good], . . . then top priority should not be given [by a newly developing country] to a mass attack on illiteracy. . . . [I]ndustrialization does not require at the outset that the majority of peasants, factory workers, porters, or servants have the rudiments of education. . . . Thus at the stage where the major concern is to develop a country's capacity for economic growth, priority should be given to the multiplication of those skills which are most critically related to economic development objectives. This calls for the creation of a modern system of education which can generate essential high-level talent. . . . [Newly developing areas] must emphasize education as an investment needed for rapid economic growth rather than as a benefit which all members of the community should enjoy before economic growth is achieved. (pp. 106-7)

This proposition, apart from neglecting the issue of the state of education existing in an underdeveloped area at the inception of modernization, challenges without documentation the widely accepted view that widespread literacy is not a consumer good but the *sine qua non* of rapid economic development. Although I have frequently been tempted by this same judgment, it seems thoroughly unwarranted to advance it seriously without examining the impact of such a policy on the areas outside of large-scale industry — in agriculture, commerce, communications, and the like.

Unfortunately, the single-minded concentration of the volume on the problem of management in large-scale industry leads to such risky policy suggestions. Moreover, this focus leads the authors to neglect the true diversity of economic requirements — organizational and technical — that exists in developing economies. I was left with the impression, despite the comparative character of the analysis, that "the logic of management development" leads inevitably toward the American image.

The volume draws together a great deal of material on the development of high-level talent and is a useful summary for persons interested in this aspect of economic change and growth. The country studies, averaging just over twenty pages, are far too brief to be very helpful in themselves but they too provide leads to substantial materials. However, the description of the situation in India is quite thorough, and the analysis of the problem of developing a managerial tradition out of the earlier pioneering and cooperative activities makes the study of Israel particularly interesting.

MORRIS DAVID MORRIS
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Pension Funds and Economic Power. By Paul P. Harbrecht (New York: Twentieth Century Fund, 1959. Pp. 328. $5.00)

Father Harbrecht in his treatise on *Pension Funds and Economic Power* presents a comprehensive review of the nature of private pension funds, their historical origins and growth, and their potentialities. More importantly, he places them in the context of basic changes in the position of financial institutions as owners and controllers of productive wealth. His concern is almost exclusively with non-insured corporate pension plans and mainly with the impact of such pension trusts on the institution of private property. He views pension funds as the financial institutions to which individuals contribute capital but by which they are cut off from even the paper ties to property control which they might have as stockholders in corporations owning productive wealth. He feels that as these institutional intermediaries become more deeply interested in the equities of corporations, their very obligations to the individuals they represent will force them to exercise the powers which have come to them as a result of their investments and that more and more the individual is losing his proprietary interest in the most significant kind of property in our economic system.

Convinced of this thesis, Father Harbrecht examines the structure of pension trusts, their characteristics, financing, and administration. He draws special attention to certain inherent limitations on the security they offer, the dependence of the employee on the continued solvency and good will of the employer and the inability of the beneficiaries to call the financial trustee to account for stewardship. He reviews the "objectives, theory and practice" of pension trusts from the standpoint of the employer, the unions, the trustees, and the beneficiaries, finding that, practically speaking, the employee's rights are limited to his claims after he has reached age 65 and has worked for some twenty or thirty years for his company, that he is now more closely tied to his union in many instances because of its contract with the employer, more closely tied to the employer because the success or failure of the business will affect the size of the fund backing his expectation of benefits, and more dependent on the general level of economic welfare which determines the yield and value of the pension fund.

Father Harbrecht examines the impact of federal and state tax and regulatory practices, coming to the conclusion that the federal tax laws have had the largest single influence on the structure of pension funds (including, by tax discrimination, throwing the weight against insured forms of retirement benefits in favor of trusteed forms of plan financing) and that state and federal laws have done little or nothing to protect the pension funds from the depredations of unscrupulous trustees, labor leaders, and racketeers.

Father Harbrecht is concerned about the growing impact of private pension fund holdings of corporate securities, their concentration in the blue chip list, their effect of contracting the active market for stocks, the concentration of buying power in a relatively small number of banks which act as trustees, and their relative freedom from government regulation (as compared with mutual funds, insurance companies, and trustees of personal trusts). His concern is strengthened by his estimate, made after a critical examination of projections by other authorities, that corporate pension assets will grow from the $19.3 billion they possessed in 1957 to $47.3-$52.7 billion in 1965 and to $84-$89 billion by the end of 1970, depending on certain alternate assumptions, and that by 1965 the pension trusts will have 35 to 40 percent of their assets invested in common stocks.

Father Harbrecht, in considering the phenomenon of pension trusts in the light of its effect on ownership of property, on freedom, and on security, draws a parallel with the development of medieval society. He compares the modern corporations with the great domains of feudal society. He sees us moving into a "paraproprietal society" in which, as a consequence of the separation of control over property from individual ownership, "man's relationship to things — material wealth — no longer determines his place in society (as it did in a strong proprietary system) but his place in society now determines his relationship to things." However, the difference between the modern corporation and the great domains of the feudal age lies in the fact that the grantors of power are not the landowners but the people themselves — and the people have powers, economic and political, which can be brought to bear on their vassals.

This review cannot begin to reflect the wealth of careful research which Father Harbrecht's book shows nor the felicity of language he commands. In using the book as a reference one may be a little disturbed at what sometimes seems some awkwardness in organization. (Much of the purely descriptive matter regarding the nature and characteristics of pension trusts is reserved until Chapter 7.) Nevertheless, this book is of such scope and depth as to be required reading for all who have any concern with the accumulation and exercise of financial power and with the framework of modern economic society.

William H. Wandel

Nationwide Insurance Company

Capital Interest and Profits. By B. S. Keirstead (New York: Wiley, 1959. Pp. ix, 180. $4.00)

In this small loosely argued volume, Professor Keirstead attempts to find answers to a number of highly important theoretical questions. The many subjects that Keirstead examines, in a rather huggermuggerdly fashion, are the determinants of private investment; the relation between profits, the returns to stockholders, and the rate of interest; capital theory; economic growth; and inflation.

Keirstead begins by defining capital formation to be the making of new tools and saving as the process of allocating labor to perform this task. After a somewhat desultory discussion of these notions, he abruptly drops them and presents his views on profit. Keirstead's main conclusions on this subject seem to be that profit is the reward for successful uncertainty-bearing and, because of uncertainty, firms will not carry their investment expenditures to the point where the marginal efficiency of investment equals the rate of interest. Continuing in this vein, he argues that monetary and fiscal policy determine the rate of interest on long-term government debt and, again because of uncertainty, the rates of interest on private debt will exceed the rate on government debt.

A disjointed treatment of capital theory concludes Part I.

Keirstead opens Part II with an interesting discussion of what he considers to be the salient properties of underdeveloped economies. He continues his line of thought by listing a few conditions, or changes, that he thinks might jar the underdeveloped countries into becoming progressive capital-accumulating economies. A brief economic history of Newfoundland, a woefully backward economy until recently, follows. Keirstead then jumps to the problem of inflation and attempts to explain the recent Canadian phenomenon of rising prices and unemployment.

The book closes with a number of well-taken, and equally well-known, criticisms of the multiplier and the accelerator.

PAUL WELLS

University of Illinois

State Income Tax Administration. By Clara Penniman and Walter W. Heller (Chicago: Public Administration Service, 1959. Pp. xiii, 280. $7.50)

The General Property Tax: Findings of the 1957 Census of Governments. By Frederick L. Bird (Chicago: Public Administration Service, 1960. Pp. viii, 84. $3.00)

Problems of state and local taxation are currently more pressing than those of the federal government, because of the inadequacy of state and local levies to finance the rapidly growing expenditures of these units of government. Although a number of tax studies of particular states have appeared in recent years, there has been surprisingly little general literature on state and local taxes. Thus these two volumes published by the Public Administration Service are particularly well-timed and significant.

The Penniman-Heller study began

life in 1939 as Professor Heller's doctoral dissertation, was finally revived and brought up to date, and published in book form. Its primary goal is a review of current state income tax administrative practices and an analysis of their effectiveness. From this review the authors develop the standards necessary for successful administration and the general conclusion that although a few states (particularly California, New York, Wisconsin, and to a lesser extent Oregon and Minnesota) are doing an adequate job, enforcement in most states leaves much to be desired and in a few is hopelessly inadequate. The study includes both personal and corporate income taxes.

The initial part of the volume contains a useful summary of the historical development of the taxes; a description of their present structures, rates, and other features; and an analysis of the merits of the taxes and the practical limitations to their extension. The authors show strong sympathy for the income tax and stress the revived interest in it in the last five years. As of 1959, 33 states imposed personal income taxes and 36 the corporate income tax. The hard core of resistance to the tax lies in four Midwest industrial states — Illinois, Indiana (although this state's gross income tax has some features of a personal income tax), Ohio, and Michigan.

In the second part, very detailed attention is given to the structure of the tax administration in the various states, with emphasis on the differences; to the systems for budgeting funds for tax administration; and to personnel systems. In this field also there is a wide variation in practice, about half the states using merit systems, the other half patronage, and all but a few paying salaries inadequate to attract competent personnel, especially for audit. The third section surveys the routine handling of returns, taxpayer relations, and delinquency control, and extensive space is devoted to the audit programs. The authors stress the inadequacy of audit in virtually all states; additional expenditures on audit would almost certainly yield additional tax revenue well in excess of the added cost. The importance of office audit for selection of returns for field audit is emphasized, in light of the limited potential scope of field audit. Withholding systems and the merits of withholding as a means of improving collections are noted, as well as the rapid development of cooperative arrangements with the federal government, which are of the utmost importance to the states in increasing the effectiveness of their programs.

Most needed reforms include provision of more adequate funds for administration; improved merit systems, salaries, selection methods, and incentives for employees; greater cooperation with the federal government and among the states; greater use of withholding; and stepped-up audit programs.

Only incidental mention is made of the legal questions relating to liability of interstate businesses, to which much interest has turned in recent years because of Supreme Court decisions.

The Bird monograph is an extremely useful summary and analysis of the very extensive compilation of data on the property tax in the United States contained in Volume V of the 1957 Census of Governments, entitled *Taxable Property Values in the United States.* Thus the material of this volume is made readily available for use. A major result is to re-emphasize, and to provide greater scientific support for, many widely accepted statements about the operation of the tax. In addition, useful interstate comparisons are shown. The major features of the operation of the tax, including assessment procedure, review, and equalization and other aspects of state participation, are summarized, as well as the results of the statistical analysis.

A few key conclusions warrant brief mention. The property tax has, of course, declined in relative importance in the state-local tax picture, despite continuing increases in the amounts collected. The relative reliance on the tax varies widely from state to state, from a figure of 70 percent of over-all state-local tax collections in Nebraska to 20 percent in Alabama. On a per capita basis, the collections in Massachusetts (the high) are six times those in Alabama (the low). The total assessed valuation of all property in the United States is $280 billion (1956); 92 percent of the locally assessed property consists of real property.

On the basis of extensive sample studies, the over-all ratio of assessed value to sale value is found to be 30 percent, ranging from a high of 66 percent in Rhode Island to a low of 7 percent in South Carolina. The Illinois figure, 46 percent, is relatively high, as would be expected in light of the efforts in the last decade to attain full-value assessment in the state. Substantial evidence of regressiveness in assessment — the tendency on the average to assess less expensive property nearer full value than more expensive property — is found. Extensive variation in the ratio of assessed to sale value is discovered, both within taxing jurisdictions and between jurisdictions in the same state. Of the units included in the sample, Los Angeles shows the least variation within an assessing jurisdiction.

Apart from the useful compilation of data, the study emphasizes, as have many state reports, the urgent need for further reform in administration of the tax. Although the levy has declined in relative importance, it remains the number two tax to the average family, and it is much more likely to grow in magnitude than to decline.

Both of these volumes are invaluable to the tax administrator, to legislators considering reform of tax legislation, and to all groups and persons concerned with improvement of tax structures and tax reform generally. Many readers will not be interested in all of the detail included in the income tax volume, but the material is so organized and presented that detail can be omitted and concentration placed on the major points of interest. Both volumes are well written, lucid, and comprehensible to the nonspecialist. In only two places would the reviewer raise serious question with statements or conclusions. One is the classification of the Indiana gross income tax as basically a sales tax, when most of the revenue comes from the portion on personal income. The other is the relative neglect of the merits of cross audit for sales and income tax purposes, which some states, such as Kansas, have found very useful.

John F. Due

University of Illinois

Employment and Output in Protected Manufacturing Industries. By Beatrice N. Vaccara (Washington: Brookings Institution, 1960. Pp. x, 107. Cloth $3.00; paper, $2.00)

This study, which is related to a larger inquiry on "Import Liberalization and Employment" by the author and Mr. Walter S. Salant which will appear later this year, is a factual inquiry into two contentions about protected industries: (1) that they are exceptionally labor-using, so that increased foreign competition tends to cause exceptionally great unemployment in them; and (2) that they are declining industries, so that adjustment to increased foreign competition raises exceptionally difficult adjustment problems.

For the purpose of the study, which is based on the *1954 Census of Manufactures,* protection is conceived of as applying to industries rather than to individual commodities. Owing to the difficulty of associating tariff rates with domestic production, protection status is measured by the proportion of the value of domestic shipments protected by a duty of 10 percent or more; but commodities are regarded as not protected, irrespective of import duty rates, if their ability to meet foreign competition is demonstrated by exports equal to 15 percent or more of the value of domestic shipments. Of the four classes of protected industries defined in this way, the "heavily protected" (75-100 percent protection) class contains two-thirds of the 311 Census industries included in the study; this class is therefore subdivided into industries having average ad valorem duty rates of under and over 20 percent. The admittedly unsatisfactory nature of this classification scheme is presumably partly responsible (1) for the fact that the results of the study tend to be based on contrasts between the two extreme classes, with the intermediate classes providing unclear or contradictory evidence, and (2) for the extensive use which is made of a subsample of 58 industries, designated as "import-competing," which had import-domestic shipment ratios of 5 percent or more.

On the basis of average annual percentage changes in output and employment from 1947 to 1954, the author finds that heavily protected industries do not tend to be declining industries. But the import-competing group is more commonly declining than is manufacturing in general, and the tendency is stronger the greater the degree of tariff protection; further, the tendency to decline is associated both with increasing import competition and with declining total demand for domestic and foreign supplies. Thus the evidence for the import-competing group tends to support the second of the contentions under study.

In examining the first contention, the author measures labor use and labor cost by the ratios of employment and wages to total value of shipments for those establishments for which at least 90 percent of shipments consisted of the primary product of the industry. The data show a correlation between degree of protection on the one hand and labor use and labor cost on the other, the relation being stronger for labor use since wages tend to be lower in the most protected industries; both relations are stronger for the import-competing group than for all manufacturing; and both are subject to substantial deviations which make individual examination of the effects of tariff changes desirable. On the whole, the evidence for the first contention is stronger than that for the second.

The statistical work for the study has obviously been performed with scrupulous care; the reasons for choices of method and data are explained, and evidence on the effects of alternative procedures is provided where possible. But the presentation of the results and the discussion of their bearing on policy raise some fundamental doubts about their usefulness for policy-making. In the first place, both contentions under examination identify the problem of adjustment to trade liberalization with the amount of unemployment of labor created in the affected industries; but there may be difficulties in re-employing other factors, and the effect on the geographical pattern of demand for labor may be more important than the effect on the industrial pattern of demand for labor, neither of which possibilities is mentioned. In the second place, the employment approach leads the author to epitomize the implications of high labor use in heavily protected import-competing industries in the proposition that a reduction of $1.00 in the output of such industries will require an expansion of about $1.50 in the output of other industries to re-employ the labor, a proposition which completely ignores the role of non-labor factors in the production process. The author aggravates the confusion by emphasizing the doubtfully relevant point that the required percentage increase in the output of the other industries will be much smaller than the percentage decrease in the output of the protected industries, and by implying that the resulting increase in output per head measures the gain from trade liberalization. Finally, both the concept of the industry as producing a range of products with the same resources and general technique, and the likelihood that trade liberalization will consist in reducing the highest tariff rates — two points which run through the author's argument — suggest that a "case-study" inquiry into the facility with which resources now used in producing protected commodities could be shifted into alternative uses might be more fruitful than the aggregative statistical approach with its built-in assumption of structural rigidity in the productive system.

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BUREAU OF ECONOMIC AND BUSINESS RESEARCH

The Bureau of Economic and Business Research, established in 1921, is the research department of the College of Commerce and Business Administration. Economic and business information, including material on tested business practices, is compiled by the Bureau and made available to Illinois businessmen and others interested in business and related problems. Although the major part of its work deals especially with Illinois, the Bureau also engages in general economic research.

Fields in which research is carried on include: accounting; marketing; retail and wholesale trade; resources and industries; transportation, utilities, and communications; banking and private finance; public finance, governmental regulation, and public policy; international trade and finance; labor, public relations, and welfare; and general economic developments.

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The Railroad Shippers' Forecasts, by Robert Ferber. ($1.00)

Employers' Forecasts of Manpower Requirements: A Case Study, by Robert Ferber. ($1.50)

Changing Structure and Strategy in Marketing. Robert V. Mitchell, *Editor.* ($1.50)

Studies in Consumer Savings 1, *Collecting Financial Data by Consumer Panel Techniques,* by Robert Ferber. ($2.50)

The Bureau also publishes the *Illinois Business Review,* which presents a monthly summary of business conditions for Illinois.